THE SHIP BOOK

DUKELOW AND WEBSTER

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THE SHIP BOOK

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By JEAN H. DUKELOW and
HANSON HART WEBSTER

WITH ILLUSTRATIONS

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THE FIRST PART

SHIPS AND WHAT THEY DO

* * *

I. "THE LINER — SHE'S A LADY"

HAVE you ever thought how strange a place the world would be if there were no ships? Do you realize how much we all depend upon the things that ships bring us from over the seas? Once, long ago, there were no ships, for men had not discovered how to travel upon the water. There were not even small boats. No one knows when or where the first boat was launched, or who built it. We do know that it was in very ancient times. In the years that have passed since that far-away time, men have constantly been changing and improving their vessels. In this book you will read about many of the different kinds of ships that we have today, and about the vessels of other times, too. You will read also about what ships do for every one of us.

Some boys and girls in Los Angeles not long ago made a study of ships. These children often went to the water front, where they could see the different kinds of vessels. In school, they tried their hand at writing stories and poems about what they saw. They learned how to make models of different kinds of vessels, both new and old. They asked many questions about what ships do nowadays, and about the ships of other days. In order that you

may become as interested in ships and the sea as they were and may share some of their happy times, the authors have written this book.

Today, when any one uses the word "ship," he is likely to mean a steamship, because in most parts of our country that is the kind of vessel that is most commonly seen. We shall begin, then, by telling you some of the most interesting things about steamships.

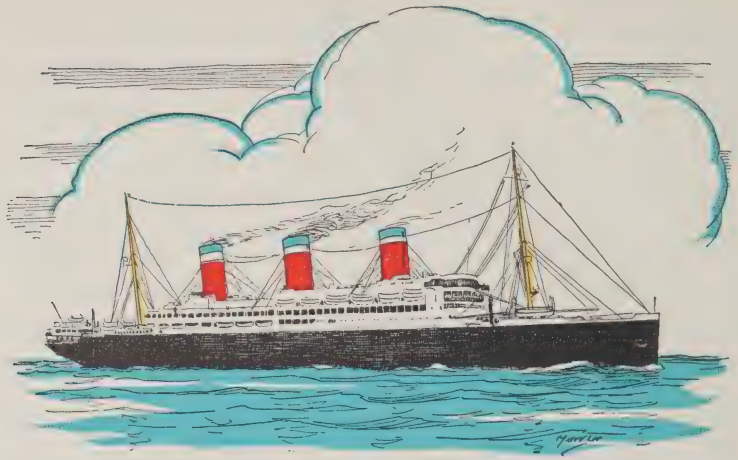
The Names of Ships

YOU may have wondered why a steamship has been given the particular name that you see painted on her bow or on her stern. Before we explain this, we must remind you that it is customary to speak of ships as if they were women. Kipling, for example, does so in his poem beginning "The liner, she's a lady." The Japanese, however, refer to ships as if they were men. Many ships are named for men, it is true. Nevertheless, if you are talking about the George Washington you say, "She sailed yesterday," or, "Her run is between New York and Hamburg." This way of speaking of ships began a great many years ago. It is doubtful whether any one knows exactly when or why.

Various plans are followed in the naming of ships. One ship may be named for the president or some officer of the company to which she belongs. An-

other may bear the name of one of the cities to which she sails. Sometimes a steamship line gives each of its ships a name ending with the same combination of letters. For example, the Cunard liners are named Aquitania, Berengaria, Mauretania, and so on; the names of the White Star liners end in "ic," such as Britannic, Homeric, Majestic, and Olympic. The largest ships of the Canadian Pacific Line are all "Empresses"; on the Atlantic this line has the Empress of Britain, the Empress of Australia, and the Empress of France; and on the Pacific, it has the Empress of Japan, the Empress of Asia, the Empress of Canada, and the Empress of Russia. One steamship line names its vessels after Greek heroes of the olden times, such as Hector and Ajax, and another after great cities of the world today. Many of the liners that belong to the Munson Line have names beginning with the syllable "Mun." The Prince Line steamers are named Moorish Prince, Arabian Prince, Siamese Prince, and so on. Another line names its ships for States — Pennsylvania, Virginia, and California.

You will find, however, that many lines do not follow any fixed plan for naming their ships. Our own United States Lines have two named for former Presidents of the United States, but the rest of the fleet appear to have been named without any plan.



This is a picture of the Leviathan of the United States Lines. She is one of the two largest steamships afloat. The other is the Majestic of the White Star Line.

You will hear of quite a number of ships named for former Presidents of the United States. All these were originally managed by the United States Shipping Board, a branch of the Government which came into existence during the World War. Many of these ships have recently been sold to private lines. Today you will find the President Roosevelt and the President Harding on the list of the United States Lines; five other "Presidents" owned and operated by the American Mail Line, and more than a dozen by the Dollar Line, including two new ships, the President Coolidge and the President Hoover.

The ships of foreign countries are likely to have

names that sound odd to our ears, but if you once learn about these names, you will usually be able to tell the nationality of the ships that bear them. Perhaps you can get some one to tell you the meaning of such names as Asama Maru, Chichibu Maru, or Tatsuta Maru. These are three of the fine vessels of the Japanese company called Nippon Yusen Kaisha — which means Japan Mail Steamship Company.

The Japanese motor ship Asama Maru is one of the most interesting ships crossing the Pacific Ocean.

Funnels and Masts

LET us imagine that we are approaching the dock where a large ocean liner is tied up. The first thing to attract our attention will be the tall funnels,

or smokestacks, which tower far above everything in the neighborhood except the ship's masts. They show above the roof of the shed on the dock, and if we know certain things about the way the funnels are painted, we can name the line to which the ship belongs.

These are the ways in which some steamship lines mark the funnels of their ships: The United States Lines, which own the Leviathan, the America, the President Roosevelt, and other ships, paint a narrow band of blue at the top, then a band of white, and bright red on the rest of each funnel. The Cunard liners also have red funnels, with quite a wide black band at the top. The White Star Line paints its funnels buff, except for a similar black band, while the Canadian Pacific funnels are all buff. The Dollar Line uses black funnels and near the top a red band on which is a dollar sign. The Japanese Mail Steamship Company also uses black funnels, but near the top there is a band of white on which are painted two narrow red lines. Can you think of a good reason why funnels should be black or some other dark color at the top?

Until recently there have been on the Pacific Ocean two steamers with unusual funnels and an interesting history. These were the Harvard and the Yale of the Los Angeles Steamship Company. When they were

first built, they sailed between Boston and New York. Then they were taken by the Government for use as transports during the World War. After that they were placed on the route between San Francisco, Los Angeles, and San Diego.

Today, unfortunately, only the Yale is afloat, for the Harvard was wrecked, May 30, 1931, on the dangerous rocks at Point Arguello. Five hundred passengers escaped by taking to the life boats, but the ship could not be saved.

Each of these fine steamers served for two years in the World War, carrying, both together, more than 400,000 soldiers safely from England to France. As a reward they were permitted to have two gold chevrons — one for each year — painted on their black funnels. These chevrons are like those that you see on the sleeves of veteran soldiers. They are reminders of gallant work. It seems a shame that one of these splendid ships came to a tragic end.

The number of funnels on a steamship may be one, two, three, or four. If you should see a ship which had no funnels whatever, but which in other ways looked like a steamship, it would be one of the first motor ships that was built. Later motor ships have either one funnel or two. Most of the larger ocean liners have either two funnels or three. Sometimes one of these is not a real funnel at all. That is, in-

stead of carrying off smoke, it is used either as an elevator shaft or as a storage place for tanks of various kinds. If used thus, a funnel is called a dummy. It is made, of course, to look just like the real funnels, because ocean travelers are quite sure to prefer liners that have more than one funnel. You will doubtless agree that a ship with at least two is more beautiful to look at. Steamship officers tell amusing stories about immigrants who have sometimes refused to go aboard a ship that had only a single funnel. These immigrants had seen posters containing pictures of steamships with two or more, and apparently they thought they were being cheated in some way when they saw only one funnel on the ship they were asked to board.

What do you notice about the angle between the funnels and the deck? Do the funnels stand up perfectly straight, or do they slant backward a little? The slope varies in different ships. In ocean liners the funnels are usually set with a slight "rake," which means a slight backward slant. This position offers less resistance to the wind, and so helps the ship to make better speed. The shape of the funnels varies, too. In the smaller, slower ships they are round; but the larger ships have oval funnels, because this shape offers less resistance to the wind. You will get some idea of the size of a ship's funnels when

we tell you that the largest ones measure 150 feet from top to bottom and are so big that if they were laid flat on the deck a railroad locomotive could pass right through them.

The earliest steamships had masts and sails because their engines could not always be depended on to propel the ship. Occasionally they had to use the power of wind and sails. Nowadays steamships have masts, but they are used only to support radio antennæ, to fly flags and signals, and to support the derricks used in handling cargoes. Most liners have two masts, but some have more. At the head of the mast at the front, or bow, the ship flies, at certain times, the flag of the country to which she is bound. On a yard across this mast, just before leaving port, she flies the Blue Peter, which shows that she is about to sail, and another flag which shows that she carries mail. The Blue Peter is a square blue flag with a white center. It is the letter P in the alphabet of signal flags described on page 79. On the mast near the stern the ship flies a "house flag" bearing the emblem of the line to which she belongs. You will find pictures of several house flags on page 78. At the stern itself, on a flagstaff, the ship displays her national ensign, but this flag, like each of the others, is not flown while the ship is at sea. Can you tell why?

The Great Ocean Liners

BY this time you are probably ready to ask several questions. Perhaps the first one is, "Why are certain ships called liners?" Some boys and girls were once wondering about this very thing. One of them said that maybe there were lines painted on the sides of the vessels. Another suggested that perhaps the steamships all followed in line, one behind another across the ocean. A third thought that probably liners ran on certain lines on the sea; that is, to certain places and then turned around and went back over the same route. One of these three children had the right idea. Which do you think it was?

There are two kinds of ocean steamship lines. One sends its ships on long voyages across either the Atlantic or the Pacific; the other sends its ships on shorter trips between ports along one coast or the other. In this book, when we speak of "liners," we mean those that cross the ocean. Coastwise steamships sometimes are smaller copies of these great vessels.

The largest and speediest ships in the world are the great ocean liners. These are really floating hotels, because they provide people who travel across the ocean with all the conveniences and comforts that our finest hotels offer their guests. These great ships have beautifully furnished public rooms called

lounges, huge dining-rooms, marble staircases, swift elevators, and wide decks for promenading and for playing games. They have also libraries, writing-rooms, gymnasiums, playrooms for children, and even shops. They have electric lights, and are heated either by steam or by electricity.

As many as five thousand passengers can be carried on the very largest liners. These people sleep in staterooms, or cabins, which are usually quite small when compared with bedrooms ashore. They are comfortably furnished, however; and, in the larger liners, passengers have beds to sleep in, instead of the old-fashioned berths. Usually there is running water in each stateroom, and the higher-priced rooms have private baths. There are also plenty of public bath-rooms. Some ships have swimming-pools.

These are some of the features that make the best liners so comfortable for ocean voyagers. When you go aboard one of these ships, you will doubtless notice other attractive things. Perhaps you already know of some that we have not mentioned.

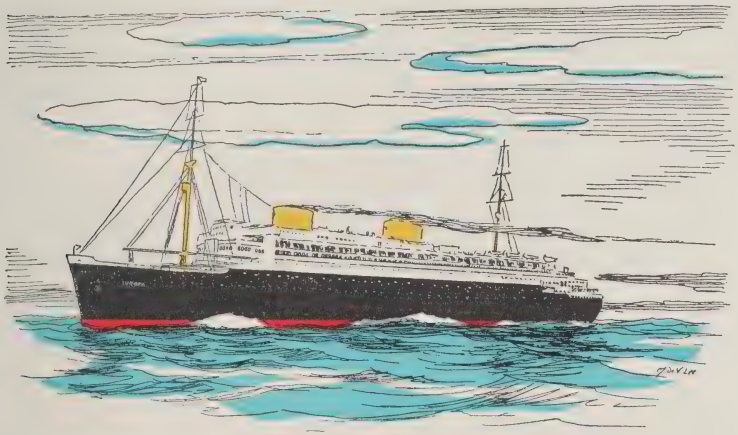
Many of the passengers on the largest liners are likely to be wealthy people who wish to cross the ocean as quickly as possible. These ships, therefore, are very speedy. Some of them can go 700 miles in a day. If you do not want to pay for as much luxury and as much speed as the largest liners have, you can travel

on a smaller ship. Practically all the ships that cross either the Atlantic or the Pacific today have been built within the last twenty-five years, and they therefore have all the modern conveniences.

The Mauretania, a Cunard liner, at sea. Nearly all ocean liners have black hulls. The ships of the Canadian Pacific Line, however, have white hulls.

In size, liners vary greatly. At present there are four that measure over 900 feet in length. The deck of the longest liner would hold a train of ten passenger cars and still have room to spare. The smallest liners are 400 feet long. A city block is likely to be between 300 and 400 feet long. A football field is 100 yards, or 300 feet long. The longest liners are also the broadest, measuring about 100 feet at their widest part. This is more than the distance from home plate to first base on a baseball diamond. The largest liners are about twice as broad as the small ones. Of course the longer and the broader a ship is,

the greater her "tonnage" is also. In measuring a ship, tonnage means the whole amount of space inside the vessel supposing her to be entirely empty, with no engines or anything else aboard. One "ton"



The German steamships Bremen and Europa are at present the fastest in the world.

is the amount of space there would be in a box 10 feet long, 5 feet wide, and 2 feet deep. Multiply these together, and we get 100. Now, suppose a vessel is 40 feet long, 10 feet wide, and 5 feet deep. Multiply these together and we get 2000. Then divide this number by 100 (the space of one ton) and we get 20 which would be the tonnage of that ship. There are five liners that have a tonnage of over 50,000. The others range from 46,000 down to about 6000 tons. The ships of Columbus were of only 100 tons or less.

Some of the largest liners in the world are the Leviathan, the Majestic, the Berengaria, the Bremen, the Europa, the Olympic, the Aquitania, and the Ile de France. These run on the North Atlantic. Other famous ships on that ocean are the Paris, the Augustus, the Mauretania, and the Britannic. On the Pacific Ocean, some of the best-known liners are the Empress of Japan, the Asama Maru, the Malolo, whose name is an Hawaiian word meaning sea-gull, the City of Los Angeles, the California, the Virginia, the Yale, the Mariposa, and the H. F. Alexander. If we were to name all the well-known ocean liners that come to American ports, we should have a list of nearly 250.

Ocean Greyhounds

THE speediest liners in the world at present are the Europa and the Bremen, which belong to the North German Lloyd Line. Each of these ships has set a new record from Cherbourg, in France, to New York. First the Bremen, on her maiden voyage in 1929, crossed the Atlantic in 4 days, 17 hours, and 24 minutes. Then, in 1930, the Europa, a sister ship, also on her maiden voyage, bettered this record by 18 minutes. Before 1929, the Cunard liner Mauretania had held the speed record. As long ago as 1908 this ship crossed the Atlantic in shorter time than any other ship had done. Then, in 1923, the Leviathan

beat the Mauretania's record; but the next year the Mauretania set a new one. As soon as it was known that the Bremen had taken the speed record from the Mauretania, the captain and crew of the Mauretania sent a cablegram to the captain and crew of the Bremen and congratulated them for what the new ship had done. On her next voyage the gallant old British vessel made a splendid effort to win back her championship, and almost succeeded. Her fastest voyages have been made since the Bremen defeated her, but she has never been able to equal the record of the newer vessel.

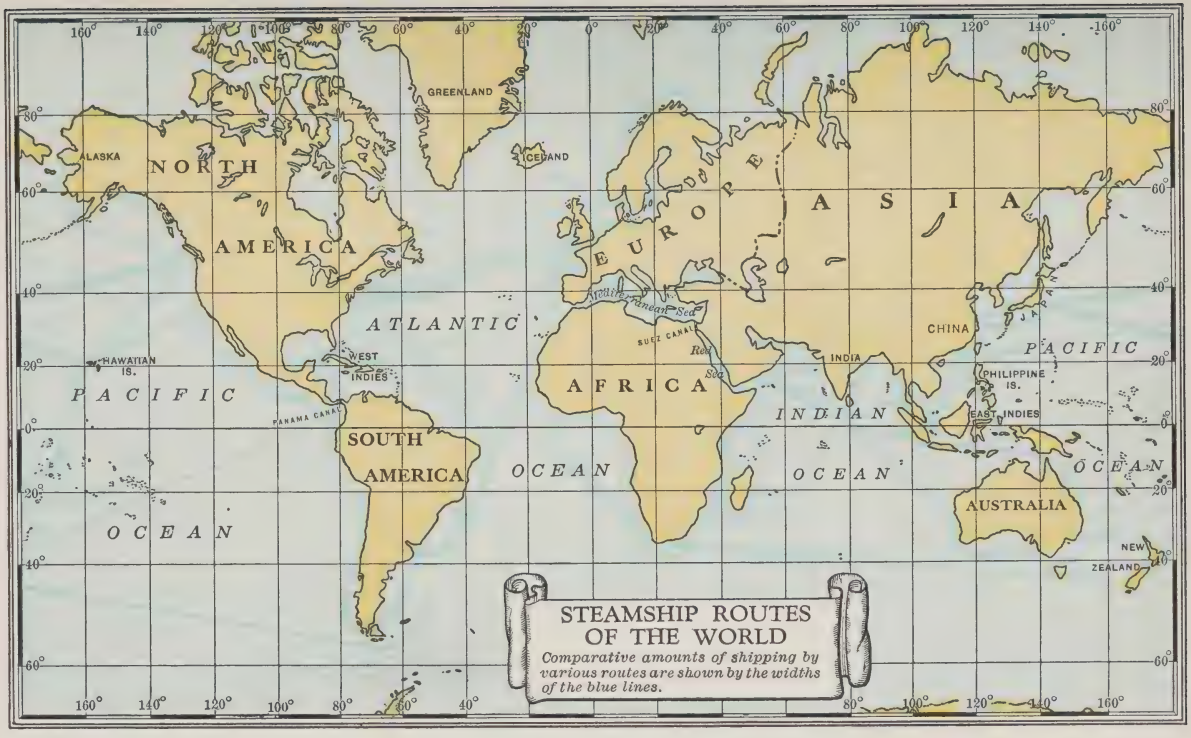
The best record across the Pacific, from Yokohama to Victoria, has been made by the Empress of Japan, a ship of the Canadian Pacific Line. You will be interested in looking up other records on the various routes on both oceans. You will see that the time required for voyages has been steadily reduced since steamships first began regular service. You will notice that the record from west to east is lower than that in the opposite direction. Can you suggest any reasons for this?

The speed of a ship is expressed, not in miles, but in "knots." The distance she travels, however, is expressed not in knots but in sea miles. This is a little puzzling but it is something that you ought to understand because so many people have a wrong idea

about it. A sea mile is equal to about one and one-seventh land miles; that is, seven sea miles are a little more than eight miles on land. By one knot, a sailor means a speed of one sea mile an hour. If the speed of a ship is said to be 20 knots, it means that she travels at a rate of 20 sea miles per hour. At 20 knots, as you will find if you figure it out, a ship covers in an hour about the same distance as a train traveling at 23 land miles per hour. See if you can find out the speed of some of the well-known liners that we have mentioned in this chapter. You will be surprised to see how many land miles the fastest ships cover in an hour when at their highest speed.

Steamship Routes of the World

IF you would like to know the ports between which the different liners sail, write to a steamship agent and ask for Sailing Lists of the various companies. For example, ask for those of the United States Lines, the White Star, the Cunard, the Canadian Pacific, the Panama Pacific, the North German Lloyd, the Hamburg-American, the French Line, or the different lines belonging to Italy or Japan. On these lists you will find, arranged by their sailing dates, the names of the various ships owned by each line and the names of the ports from which and to which each ship goes. You will be interested to notice the number of days that


GREENLAND
ICELAND
ALASKA
NORTH
AMERICA
EUROPE
ASIA
ATLANTIC
OCEAN
Mediterranean Sea
SUEZ CANAL
Red Sea
AFRICA
INDIA
CHINA
JAPAN
PACIFIC
OCEAN
HAWAIIAN IS.
WEST INDIES
PANAMA CANAL
SOUTH AMERICA
INDIAN OCEAN
PHILIPPINE IS.
EAST INDIES
AUSTRALIA
NEW ZEALAND
STEAMSHIP ROUTES OF THE WORLD
Comparative amounts of shipping by various routes are shown by the widths of the blue lines.

each ship takes in making its voyage. See if you can find out the number of miles from one port to the other.

The map on page 17 shows the location of the most important steamship routes. You will notice that there is a very broad blue mark across the North Atlantic. This means that more steamships cross the ocean at this point than anywhere else. The route between New York and England, France, and Germany is the most important in the world. You will find other heavy marks between Europe and South America, and lighter marks across other oceans. You will understand from these marks that there are regular routes, for example, from New York through the Panama Canal to the Pacific Coast, and from the Pacific Coast to the Orient. There are others from European countries through the Mediterranean Sea, through the Suez Canal and the Red Sea, and then across the Indian Ocean to India, Australia, and other places in the Pacific Ocean. What other routes can you trace?

BOOKS THAT YOU WILL ENJOY

In this list, and at the end of other chapters, we give you the titles of a few books that you will enjoy reading. All of them have many pictures. Most of them contain stories that you will want to read in connection with other parts of this book, as well as in connection with the chapter with which we list them.

"The New Book of American Ships," by O. P. Jackson and F. E. Evans.

"My Book of Ships," by C. J. Allen and J. R. Hind.

"The Wonder Book of Ships," by H. Golding.

"The Atlantic Ferry in the Twentieth Century," by F. R. Corson.

This book has sixteen pages in color showing the flags and funnels of different steamship companies.

"A Child's Geography of the World," by V. M. Hillyer.

Tale 24, "The Bridge Across the Ocean."

"Travelers and Traveling," by E. M. Tappan.

Chapter X, "The Great Highway of the Ocean."

Other books containing chapters about steamships are listed on page 240.

"The liner — she's a lady but if she wasn't made,
There still would be the cargo boats for home and foreign trade."

Another poem of Kipling's, called "Big Steamers," contains these lines:

"Oh, where are you going to, all you big steamers,
With England's own coal, up and down the salt seas?
We are going to fetch you your bread and your butter,
Your beef, pork, and mutton, eggs, apples, and cheese.
For the bread that you eat and the biscuits you nibble,
The sweets that you suck and the joints that you carve,
They are brought to you daily by all us big steamers,
And if any one hinders our coming you starve."

Cargo Liners

KIPLING is an Englishman, and he is speaking of the things that the steamships of his country carry to the British Isles. The United States is not so dependent as many other countries are upon the products of other lands. At the same time, we import many things.

Have you ever counted up the everyday necessities that are brought to us from over the seas? What are some that you can think of? Let us begin with our clothing. The cotton in our underwear may have been raised in Egypt or in India. Even if it grew in our own Southern States, ships may have taken it to the factory towns. The wool in our suits or overcoats perhaps came from sheep in Australia, Scotland, or the Argentine. The leather in our shoes may have been supplied by cattle raised in South America. The silk in our dresses and neckties possibly was spun in France or in Japan. The linen of

which our handkerchiefs were made is likely to be a product of Ireland. At the breakfast table you see other things from far-away places. There may be bananas from Honduras or Costa Rica. Your father and mother drink coffee from Brazil, and you perhaps drink chocolate from Mexico or Holland. The china may be either English, French, or German. Following up these hints, see how long a list you can make up. You will probably be very much surprised. Wherever you are, look about and try to name things that are brought to us by ships.

Here is part of a list of things that one girl saw one day in New York on a pier where two ships had just left their cargoes. You will see that these goods came from many different parts of the world:

Paper and Christmas toys from Germany.
Rags and hops from Belgium.
Tea and crackers from England.
Fish from Portugal.
Canned mushrooms and peas from France.
Hemp from Manila and New Zealand.
Jute from Tampico.
Condensed milk from Switzerland.
Soap from England.
Rubber from the Congo.
Sardines from France.
Nuts from Brazil.
Matches from Sweden.
Shoes from Czecho-Slovakia.

The great passenger-carrying steamship lines usually have in their fleets cargo-carrying steamships also. These cargo liners have regular dates for sailing and they follow fixed routes. They carry any goods that may be sent to them. In size they may be as big as 10,000 tons, and may measure 500 feet long. Some of the largest ships will hold as much freight as could be loaded on a train of cars more than a mile long.

Cargo liners are strongly built, handsome ships, and have powerful engines. Some of them can make a speed of fourteen knots. They have a few cabins for passengers, and people who travel on these ships find them very comfortable.

The Voyage of a Cargo Liner

HERE is the story of the homeward voyage of a cargo liner from Vancouver in British Columbia. It shows you how these vessels work. This ship, belonging to an English company, left Vancouver on November 6th of a recent year, having taken on board several hundred cases of canned salmon and partly filled the refrigerator space with apples packed in boxes. The next port of call was Seattle, where more cases of canned salmon were loaded, besides some salmon salted down in barrels.

The ship then went through Puget Sound to Ta-

coma, where 35,000 doors made from soft wood grown near by were put on board, besides 900 tons of copper which had been brought by sea from the mines of Alaska. Steaming back through the Sound, the ship, upon reaching the Pacific, headed south for the Columbia River and docked at Portland, Oregon. Here 30,000 more doors were put on board, besides more boxes of apples, for which this region is famous. Also there were loaded 3000 tons of grain and a quantity of flour.

The next stop was at San Francisco, where some redwood lumber was loaded, besides boxes of dried apples from the Great Valley. The boat then crossed San Francisco Bay to Oakland, where more fruit, including raisins, prunes, and fresh apples, was put on board. Passing out through the Golden Gate, the ship again headed south and stopped at the Wilmington and San Pedro docks, which have been built to serve the city of Los Angeles. Here the cargo taken included cotton, borax, asbestos, and linseed oil. The ship, almost fully loaded, now made direct for the Panama Canal.

At Balboa, on the Pacific end of the Canal, some bales of cotton and a shipment of raw hides were taken from the warehouses. The cotton had been brought by another ship from Peru; the hides had been collected by a coasting steamer from the small

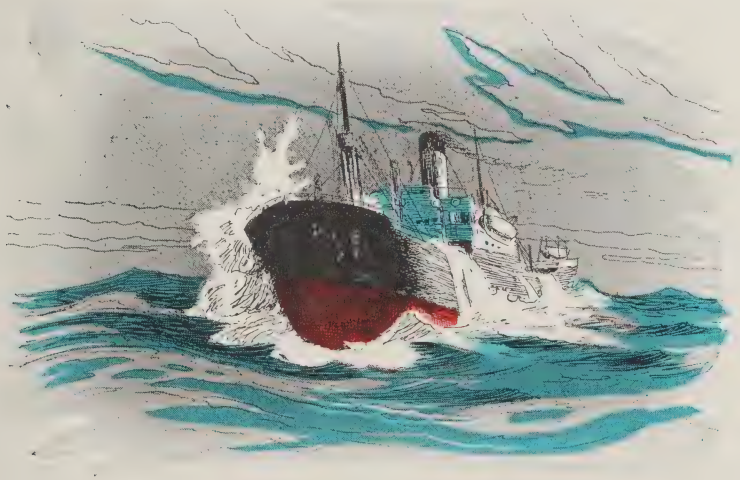
Pacific ports in Central America. This brought the total cargo value to more than $1,000,000.

After the passage through the Canal had been made, the ship's fuel oil bunkers were filled up at Colon and she proceeded direct to Liverpool, which was reached on December 30th. Thus the voyage lasted over seven weeks. An interesting fact is that all food supplies for the return as well as the outgoing voyage had been taken on board in London, when the vessel first left England. The only exception was a little fresh fruit taken on at Colon. This plan is often followed, even though fresh supplies could be obtained along the route.

A cargo liner carries a great deal of freight, but only a few passengers.

Other Cargo Ships

THERE are other ships that do an even greater part of the work of carrying freight than the cargo liners do. Most of them are owned by smaller companies and travel about the seas, going wherever their owners send them. They are sent to one port to pick up a cargo, let us say, of coal. This they carry wherever they are ordered. At that place they unload, fill their holds again, perhaps with grain, and move on to another port. This is the way these steamships do, over and over again, year in and year out. They seem to have no time to rest in a home port and no regular habits.



Tramp steamships are the hardest-working vessels that sail the seas.

You can see that cargo ships are hard workers. It is no wonder that they usually do not look as spick and span as the passenger liners. Because they are built to carry freight, and not people, every bit of space must be used for the storage of whatever the ship is to carry. Cargo ships, therefore, are plain and unattractive. Usually they have only a single funnel, and their masts are nothing but strong posts to support the derricks used in loading and unloading. The paint on the deck-houses is likely to be battered and worn; the decks may be grimy; and the sides of the ships are quite sure to be streaked with rust, especially along the water-line. Here and there you will see patches of red. These mean that here all the outer paint has been worn off and that the crew have begun to repaint the vessel. The first coat must be red lead paint, to protect the steel sides. Over that, when they can find time, the sailors will put on the outer coat of black paint.

Do you know the common name for the cargo ships that we are now reading about? These hard-working ships are called "tramps." Perhaps you know what a human tramp is. He is seen once in a while tramping along the country road, carrying blankets, clothing, and everything he owns in a small pack on his back. When he is hungry, he sometimes asks for work at the farmhouses; but he never works very

hard, or very long. His clothes are dirty and shabby, and he very clearly has no home. Now you understand why the name tramp has been given to the ships that we are reading about. Do you think that it is fair? No ships in the world work so hard as these. They keep constantly on the move, but that is about the only way in which they are like their namesakes.

In size, tramp ships are smaller than liners. The largest ones are about 400 feet long. Their tonnage may be as much as 5000, or as little as 1500. They are also slower vessels, for they usually steam at a speed of about nine knots. As we have already said, they travel all over the world. They will go anywhere, at any time, and they will carry anything. Their rates for cargoes are low, so it costs much less to send freight on tramp ships than on the great liners. Special types are planned for special uses. There are ships for carrying oil or coal in bulk; others for cargoes of cotton or wool in bales. Still others are filled with pens for cattle. But most tramp ships have great holds that may be filled with boxes or barrels, lumber, or anything else. All modern cargo ships are strongly built and seaworthy.

Not long ago, a British tramp ship named El Oso came into one of our Pacific ports, where some children visited her. First they found that her name is Spanish and means The Bear. Next they were told

that she was on her way to China. She was going to remain at the dock only about ten hours, because that is the time it would take to fill her hold with oil. She was being loaded by means of two large hose lines, through which the oil was pumped. One of the officers said that the voyage to China would take twenty-two days. When one of the boys asked where El Oso would go after that, the officer told him that she would go first to Australia, then to Borneo, and after that to England. The whole voyage would take about six months. The children learned that the different cargoes that El Oso was to carry between the various ports had been arranged for months in advance. The owners of tramp ships have to plan far ahead, because cargoes are never found just waiting for a vessel to come along and ask for them. So, you see, tramp ships are not mere aimless wanderers. Like all other ships, each has a home port, whose name you will see painted on the stern; but it is not uncommon for a tramp ship to spend several years at a time away from the place that she calls home.

Kipling's poem "The Merchantmen" and Masefield's "Cargoes" are good ones to read in connection with this chapter. There is also a book by Oswald Kendall, *The Voyage of the Martin Connor* which tells about a tramp steamer and her experiences in South America.

Oil Tankers

YOU may see at the docks a steamship that looks very different from the usual cargo carrier. For one thing, her funnel is almost at the stern, rather than amidships. Instead of a long deck-house, she has a small one about halfway between her bow and her stern, and another "way aft" as the sailors say when they mean near the stern. There are no derricks on her masts. Great pipes run almost her entire length.

Oil tankers are very different in appearance from other ocean liners.

You will know that this steamship is not a tramp, because of the way her funnel is marked. Perhaps she has a black funnel, painted with a white letter "S"; or possibly one with two narrow white lines around it. The first of these means that the steamship belongs to the Standard Oil Company. The

other, that she belongs to the line whose short name is "Agwi" — meaning Atlantic, Gulf and West Indies. Now, can you guess the cargo that this strange-looking vessel carries?

Yes, it is oil. The ship herself is called a "tanker," because her hold is full of tanks for the storage of her cargo. Both lengthways and crossways inside the ship run strong steel walls that divide the hold into two dozen or so tanks. There are powerful pumps that force the oil through pipe-lines and into these storage spaces. The engines, as you know from the location of the funnel, are as far aft as it is possible to get them. Can you think of a good reason? Is it to guard against setting fire to the dangerous cargo?

Not so very many years ago, oil tankers were unknown. Now they are likely to be seen anywhere on the ocean. There are probably about one thousand of these ships afloat, of which fully one half fly the American flag. You will find it interesting to learn the location of the places throughout the world where oil is produced, and the routes followed by different lines of tankers.

Tugboats

THE great passenger liners and cargo carriers cross the ocean under the power of their own engines. When they wish to enter or leave a dock, however,

they have to depend upon their small sisters, the harbor tugboats. These seem to be the busiest little craft afloat. For their size, they are certainly the most powerful.

One of the most interesting things to watch, either from the deck of a ship or from the shore, is the way mammoth vessels are handled by these tiny ones. Imagine yourself watching the America putting to sea. The liner lies at the dock, with her bow toward the shore. First she slides along the side of the dock, backwards, drawn by great ropes called hawsers, upon which one or two tugboats are pulling. Then other tugboats quietly puff up close to the liner. When the last hawser has been thrown off, a signal is given. Three or four tugboats gently butt their well-padded bows against one side of the America near the stern. They shove until you wonder that the ship's steel plates are not bent inward. This shoving is done according to a careful plan, and when the bow of the liner has been swung out toward the harbor, other tugboats come up and add their strength. All together, aided by the slowly working engines of the ship herself, they guide the great ship safely through the crowd of vessels, some of which are moving, while others are anchored. Presently the America's own engines are speeded up, and slowly the ship begins her long voyage. The tugboats whistle their farewell, and

puff away to their next job. Perhaps they will take an incoming liner into her dock.

To look at a harbor tugboat, you would not believe her at all powerful. She is hardly more than one tenth as long as a big cargo carrier, and she lies very low upon the water. Her hull, though, is very deep. If you were to see a tugboat being repaired in a dry-dock, you would be surprised to notice how much of her hull is below the water-line. This is one thing that adds to her power, because it buries her propeller deep in the water. Then, too, she has a powerful engine, and her propeller is a very large one. One tugboat can take a vessel much larger than herself around a harbor without making any fuss; and we have told you what a group of them can do.

There are larger tugboats, called ocean-going, which can pull or tow long strings of heavily loaded barges from one port to another. In towing, a strong wire cable or hempen hawser is strung from the stern of the tugboat to the bow of the first barge; another is fastened between the stern of that barge and the bow of the next, and so on through the line of barges. Once in a while the whole procession is as much as half a mile long. The barges may be loaded with coal, with oil, with rock or sand, or with other things. On our western coast, ocean-going tugboats often tow great rafts of logs, especially in Puget Sound. Tug-

boats that go to sea are, of course, much larger than those that work only in harbors.

Dredges

SOMETIME you may see a very peculiar craft anchored out near the entrance to a harbor, or close to the channel. She looks more like a great steam shovel afloat than anything else you can think of. When you go close to her, you hear a clanking and groaning of machinery quite different from the steady whir and hum of a steamship's engines. The vessel is evidently not in motion, but she is working very busily. You may perhaps find a scow alongside, loaded with mud. Can you imagine what is going on?

This vessel is called a dredge. Her work is to dig down into the bottom of the harbor and scoop up anything that would interfere with ships moving about. A dredge's job is to keep channels clear, to widen them, and to deepen places where ships anchor, or where they go into the docks. The bottom of a harbor never stays clear very long. The ocean tides sweep in sand and pieces of rock. Rivers, as they flow along, carry mud which gradually sinks and forms a bar across which vessels cannot go without danger of running aground. We depend upon dredges to keep waterways deep and clear of whatever

would damage vessels. They are to be seen, not only along the seacoast, but also on rivers, lakes, and canals — indeed, wherever vessels pass to and fro.

Dredges are not all alike. We shall tell you about three common kinds. One is a strongly built barge, and has a derrick which can be swung in a semicircle like a steam shovel. This dredge uses a hinged scoop or dipper, which opens and shuts just as a clam shell does. By means of the derrick, the huge steel dipper is lowered to the bottom, and then opened and drawn along so that it will scoop up mud and sand. When it is full, the dipper is closed and hauled up over the scow. Then it is opened again, and its load of sand or mud is dumped. When the scow has been loaded, it is towed out to sea and emptied, while another takes its place beside the dredge.

Another kind of dredge is built so as to work much faster than the one we have described. On her deck you see a long, sloping, ladder-like framework. This is known as a gantry. It works an endless chain, on which are fastened a string of steel buckets, one behind another, each with its open mouth turned the same way. These buckets are carried down into a well which passes right through both the deck and the hull of the dredge. They dig into the bottom of the harbor and bring up their load through another well. Of course the sides of both wells are built into

the hull of the dredge, so that no water can get into other parts of the vessel. As fast as the loaded buckets reach the top of the gantry, they tip over and dump their contents either into a scow or into the dredge herself. Then the endless chain takes them down under water for another load. When a load is ready to be dumped, either from a scow or from a dredge herself, great doors in the bottom of the vessel are opened by machinery. It takes only about five minutes to empty the largest of these vessels.

The largest type of steamship employed in this heavy work is the suction pump dredger. She looks more like a real ship than the others that we have described. She reminds us of an oil tanker, since her funnel is at the stern. She does her work by lowering to the bottom long pipes which are nearly forty inches across. Through these she pumps up into her own hull great quantities of sand and mud. When loaded, she steams out to the dumping grounds. Of course a ship as large as this can be used only where there is plenty of sea room.

Stockton, California, is 92 miles inland from the Pacific. It has never been possible for ocean steamships to reach that city. Only river steamers could go through the long narrow canal leading from the sea. At the present time great dredges are at work widening and deepening the channel. They are also

digging a large harbor close to the city. It will take a year or two more to finish the work, but when it is done, Stockton will be a real seaport. Ocean liners can then sail from the Pacific through the canal and into the harbor. Nearly the whole of the Los Angeles harbor, too, has been made in this way. If there had been no dredges, this could not have been made possible.

All along the Mississippi River dredges are used a great deal of the time to clear away sand bars formed on the bottom of the river. They pump up sand and water and force it through long pipes that lead some distance beyond the river banks. In this way the sand is carried to low places in the land and spread out to build it up. The water either sinks into the new soil or else flows away. The same thing is often done along the shores of seaside or lakeside harbors. The harbors are thus made deeper and safer for vessels, and any low land along their shores is filled in.

Ships on Rivers and Lakes

WHEN the English first settled in America, they built their villages either on the seacoast or on the banks of rivers. It was easier to travel between different parts of the country by water than it was by land, because water was a sort of ready-made road for boats, while on land people had to cut a way through the forest before they could build roads for their wagons.

On the rivers the settlers first used canoes or dug-outs like those of the Indians, or else they made rafts. After a while, on big rivers like the Mississippi, they made large rafts, built small shacks on them for shelter, and traveled long distances up or down the river. At the end of their journey, they either broke these rafts up and sold the lumber or else used it to build new homes.

Later there were other ways of traveling on the Mississippi. There were real boats, with keels, and with masts and sails. They were long and slender, and sharp at both ends. They were lightly built and carried passengers. There were also heavy cargo barges, sometimes 80 feet long and 18 feet wide. They were moved along by men who thrust long poles into the bottom of the river. As the boat went ahead, these men pushed on their poles and walked back toward the stern of the boat. When they got to the stern, they pulled their poles out of the mud, ran to the bow and began again to push against the river bottom. This was slow hard work, and it took a hundred days to pole a barge between Cincinnati and New Orleans.

After Fulton built his steamboat, the Clermont, it was not long before paddle-wheel steamers began to ply on rivers that were deep enough. In the course of time, some of these steamboats were built with a

single paddle-wheel at the stern instead of one on each side. The steamers on the Mississippi were strange-looking boats. They burned pine wood for fuel and sent great flames shooting out of their high, slender smokestacks. They had low, blunt bows and wide decks, and were sometimes 300 feet long and 50 feet broad. Above the decks were cabins that rose from 40 to 70 feet into the air, with a pilot-house standing high above the topmost deck. The hull was not more than three feet deep below the water, because in many spots the river was so shallow that a deep boat would run aground. The bottom of these stern-wheelers was flat.

A few freight and passenger steamboats, something like these old ones, go up and down the Mississippi today. More often you will see a tow of freight barges, fitted close together like the cells of a honeycomb, pushed along by a powerful towboat of the most modern sort. People usually travel by trains that go along the banks of the river, and cross it on bridges. There are also big ferries that carry trains across the river at some points. The same thing is true of other great rivers on which large cities are located.

Many huge passenger steamers run on the Hudson River. They are of 3000 tons or more, and have many decks. The fastest ones have a speed of over 20 knots. Some of them are driven by side wheels, and

some by propellers. They can carry thousands of people. In order to get as much room for their cabins as possible, there are wide and long decks that reach out either on top of their paddle-wheel boxes or over the water at the stern. See if you can find out about the Hudson River steamer named Washington Irving, and compare the facts you learn with what you know about Fulton's Clermont. This will show you how greatly river steamboats have improved since 1809.

About a hundred years ago, Americans became very much interested in building canals. Some of these connected one river with another, and some were built between two cities, like the Erie Canal between Buffalo and New York. These canals were hardly more than wide ditches, not very deep, filled with water that flowed into them from rivers. On the canals traveled clumsy scows or barges called canal boats. They were broad and had rounded bows, and were drawn along by teams of mules, driven on a towpath built alongside the canal. The mules towed the boats by means of long ropes fastened to the bows of the boats.

Today there are nearly 2500 miles of canals in the United States that are in actual use. The longest one is the Erie Canal, 339 miles, which has been much improved since it was first built. It is, however, only 7 feet deep, so very large vessels cannot use it.

There are a number of ship canals from 15 to 30 feet deep, like the Cape Cod Canal in Massachusetts, the New York Barge Canal, the Port Arthur Canal in Texas, and the Sault Ste. Marie Canal which connects Lake Superior and Lake Huron. Through these big canals ocean-going vessels can pass. On some of them you will see steamships for passengers and freight, and on others oil tankers, and grain and ore carriers.

This is a picture of the Washington Irving, one of the Hudson River steamers.

The Panama Canal, of course, is the most important one owned by our country. It is used by all kinds of ships from all over the world, and the more you read about it in the newspapers, magazines, and books, the prouder you will be of the fact that Amer-

icans built it. It was a very difficult and expensive piece of work, but it has done a great deal for the shipping of the world. Can you tell how?

A freight carrier on the Great Lakes. The cargo is either grain or ore. At the bow you see a great derrick which is used in loading and unloading the vessel.

The early settlers on the Great Lakes built the same kind of sailing vessels that were used on the ocean. Today these lakes carry the greatest fleet of steamships afloat on fresh water anywhere in the world. During the winter, the lakes are frozen over, and neither freight vessels nor passenger boats can sail from port to port. But in the open months many deeply laden ships sail all the way from Duluth on Lake Superior to Buffalo on Lake Erie, carrying ore and grain. Most of these freighters look more or less

like the oil tankers that you see on salt water, for their engines and funnels are far astern. There are other ships called "whalebacks" because of their rounded sides. They have small deck space but can carry immense cargoes. There are also big passenger liners that sail regularly between half a dozen ports. In size these are about the same as the medium-sized ocean liners, and they look much like those ships. They must be strongly built and seaworthy, because there are sometimes severe storms on the Great Lakes.

Plans are now being made to improve the canals of the United States and Canada, and the channels of the St. Lawrence River, so that steamships can go all the way from Europe to the cities on the Great Lakes. You will be able through reading the daily papers to follow whatever progress is made. At the present time seagoing ships can go up the Mississippi River as far as Baton Rouge, Louisiana, which is about one hundred and fifty miles from New Orleans. Perhaps some day this great waterway will be improved so that they can go much farther.

BOOKS THAT YOU WILL ENJOY

"Sailing the Seas," by J. Baldwin and W. W. Livengood.
"The Boys' Book of Ships," by C. E. Cartwright.
"Representative Cities of the United States," by C. W. Hotchkiss.

Several seaports, river ports, and ports on the Great Lakes are described — San Francisco, Portland (Oregon), Seattle, New Orleans, Duluth, Minneapolis, St. Paul, Chicago, Pittsburgh, Savannah, Boston, and New York.

III. SAILING SHIPS

Square-riggers and Fore-and-afters

IN the old days, all ships were sailing vessels built of wood. There were no ocean steamships until about a hundred years ago. The earliest of these were wooden vessels, too. Today, the sailing vessels that carry cargoes are very few. If you should visit any seaport in which you could count one hundred merchant vessels of all kinds, the chances are that only three or four of them would be sailing vessels.

We speak of sailing vessels as either "square-rigged" or "fore-and-aft rigged." Square-rigged means that one or more of the vessel's sails run crosswise. Fore-and-aft rigged vessels carry sails that run lengthwise. The bow is the fore or forward end, and the stern is the aft or after end. Nowadays the word ship is used when we speak of any good-sized vessel, whether she moves by wind and sails or by power from an engine.

In the old days "ship" meant only one thing — a sailing vessel with three masts, all of which were square-rigged. If a vessel had three masts of which the two forward ones were square-rigged and the other, nearest the stern, was fore-and-aft rigged, she was called a barque. A vessel having two masts, each square-rigged, was called a brig. These were the most common types of square-riggers. There were also barquentines and brigantines. The drawings show you how each of these looked.

These drawings show the arrangement of the sails on a full-rigged ship, and on a barque.

Of the five kinds of square-riggers, the barque is now much more likely to be seen in American ports than any of the others. You may perhaps sometime see a sailing vessel that has four masts, all of them square-rigged, except the one nearest the stern. She is likely to be a barque, built quite recently and probably made of steel instead of wood. The old-fashioned ships, which probably were the most beautiful vessels that ever sailed the seas, are now almost never seen. In another chapter we shall tell you something about several of the most famous ships of bygone days. It is interesting to know that some of those well known in other seas are now ending their service on our western coast. Their trade is the carrying to San Francisco of fish canned in Alaska. Some square-riggers are used in the lumber trade between our Pacific Coast and Australia. They are usually barquentines, and they may have either three, four, or five masts. In the parts of the ocean crossed

by these vessels, the winds are steady, so it is practical to use sails. Lumber is a cargo that does not spoil, so the long time needed for a voyage under sail can very well be allowed. Then, too, these barquentines almost always have engines which they can use when necessary.

These three vessels, from left to right, are a barquentine, a brig, and a brigantine.

At the present time schooners are the type of sailing vessel most often seen. Most of them belong in Atlantic ports. Many are fishermen, while others carry lumber, coal, railroad iron, and other bulky freight. Schooners may have two masts, or three, or four. A very few have been built with five, six, or seven masts.

The name of this type of vessel was originally spelled "scooner." The dictionary says that the word "scoon" means "to skip or skim on the surface of the water." When the first schooner ever built was launched at Gloucester, Massachusetts, more than two hundred years ago, she slid into the water and glided out into the harbor so swiftly and gracefully that one of the watching crowd cried out, "See how

she scoons!" The man who designed her had not yet decided what to call his craft, for she was quite unlike any other. He was pleased with this compliment, and his reply, "A scooner let her be," settled the name for the new type of vessel.

Except for the building of Fulton's steamboat, the Clermont, about which we shall tell you later on, the invention of the schooner was the most important event that ever took place in American shipbuilding. The fore-and-aft rig proved easier to sail than the square-riggers, so that smaller crews were needed. This made schooners a very cheap method of ocean transportation; and as the years passed, they came to be almost the only type of vessel used in coastwise trade. Nowadays there are not nearly so many sailing schooners as there used to be. Can you tell why? On the Pacific Coast the name schooner is often given to vessels that are propelled by engines although they have also masts and sails.

There is a fine poem about sailing vessels by Thomas Fleming Day that you will enjoy reading. It is named "The Coasters."

Fisheries

FISHING is an important industry all over the world. It is also interesting to know about. As a rule, northern countries depend upon their fisheries

for food more than the southerly ones do. Norway, for example, is a cold, mountainous land where farming and the raising of cattle are done under great difficulties. Much food, therefore, must be taken from the sea, and a large number of the people are engaged in fishing. If you should talk to any group of sixteen men in Norway, you would probably find that one of them was a fisherman. In our own country, not more than one man in a thousand would be.

The fisheries of the United States, however, are more valuable than those of any other country. Alaska each year produces fish worth more money than we paid for the entire region when we purchased it from Russia. Very valuable fishing grounds lie off the northwestern and the northeastern coasts of the United States. The fisheries of more distant northern regions like the Faroe Islands, Scotland, and Canada also are among the finest in the world.

In Japan, fishing is so important an industry that boats are launched with a good deal of ceremony. A launching takes a whole day. First the owner and his friends gather for a feast which lasts two hours or more. Then a procession marches to the shipyard, where the vessel lies complete except for masts and engine. Rice cakes are given the crowd of children who have come to watch the launching. The boat is

decorated with flowers, and flags are hoisted along her sides. The owner and his best friends go aboard and as a joke are promptly thrown into the water from the stern and ducked. Finally a tug pulls the boat into the harbor, and the launching is over.

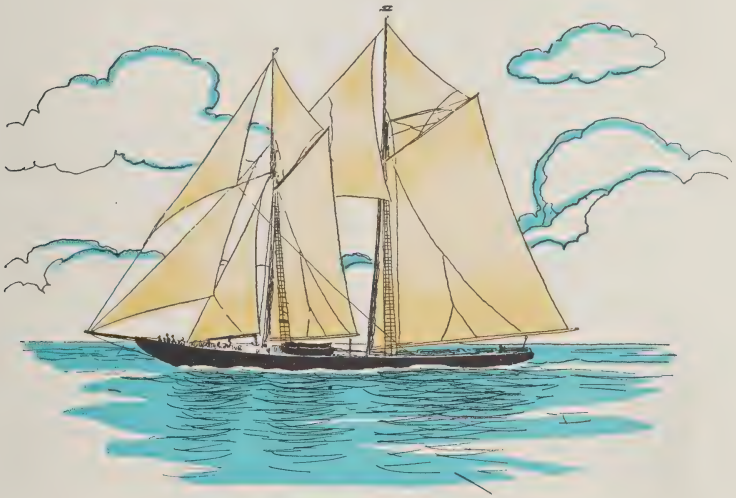
The people of Japan eat more fish than the people of any other land. Can you find out why? Russia, France, Portugal, the Netherlands, England, and Ireland are other countries where the catching of fish for food is a common occupation.

Within three miles of the shores of each country, the right to fish is limited to the people of that country. Beyond that limit, the waters are free to all. We, naturally, are most interested in the deep-sea fishing boats used by Americans, so we will now tell you about the vessels that you are most likely to find in our own harbors. In addition to the larger ones, you will see, especially in the Pacific ports, a good many small power boats that go only on short trips and return home day by day to market their catch.

Fishing Boats

IN many American seaports, you will see large numbers of fishing schooners. There are probably more of these in Boston and Gloucester, Massachusetts, than anywhere else, because the richest fishing grounds off our coasts are quite near these places.

Can you find on your map the location of Newfoundland, the Gulf of St. Lawrence, and the Bay of Fundy? These are some of the fishing grounds to which New England vessels go. They are visited also by fishermen from Europe. Read Whittier's poem "The Fishermen."



This is one of the fishing schooners of Gloucester, Massachusetts.

The fishing schooners are strongly built of wood, and usually have two masts. All the modern ones have engines as well as sails. The sails are fore-and-aft. Schooners are able to ride out the severe storms that are often met at sea. They are fast sailers, and although their tonnage is small — usually from 50 to 80 tons — they can carry large loads of fish. Schoon-

ers have been known to bring home over 300,000 pounds. Frequently they stay away from port for weeks at a time.

Now let us tell you how the fishing is done. We shall begin with cod-fishing, since cod is one of our most important fishes. In olden days, deep-sea fishing was done by hand-lines from the decks of vessels. This was slow work. Nowadays, the usual way is by means of trawls. A trawl is a very strong line, often a mile in length, to which three-foot lines are fastened, six feet apart. Sinkers and baited hooks are fastened to the ends of these short lines. Until the fishing begins, the trawls are kept carefully coiled in big tubs. The trawls are set in the water by men who go out from the schooner in small, flat-bottomed rowing boats, called dories. Every fishing schooner carries quite a number of these stacked on the deck like saucers, one inside the other, until it is time to use them to set the trawls.

Then, after the trawl has been in the water for some time, the fishermen drag it out and pass it over their dory. When they come to a fish, they take it off the hook. After getting their dory loaded, the men signal the schooner by holding an oar up in the air. The schooner sails up to one dory after another, and takes the fish on board. Fresh bait is put on the hooks, and the trawls are again set. The fish are prepared

for storage in the schooner's hold, where they are kept on ice until the end of the voyage.

The schooner keeps cruising about among the dories while her men are attending to their trawls. Sometimes, because of fog or snow squalls, the men in the dories lose sight of their vessel and have a long hunt before finding her. Sometimes heavy seas break over the little boats and drive them far away from the schooner. Men have been known to row about for days before being rescued. They have been brought back to their schooner half starved, almost dead from thirst, and, even during summer months, perhaps frozen. The life of a fisherman is truly a hard and dangerous one, but many a man sticks to it for a lifetime. Read Kipling's *Captains Courageous*, if you would like a thrilling story about experiences of fishermen on the Grand Banks of Newfoundland. This will give you a much better idea of their life than we can. It is a book that both boys and girls should read and read again.

Cod live at the bottom of the ocean. So do other fish, more or less like them, such as haddock and halibut. These are called ground fish. Other fish — for example, mackerel and herring — swim in large "schools" at the surface. They are caught in quite a different way from the one used in catching cod. Vessels that catch them are called seining schoon-

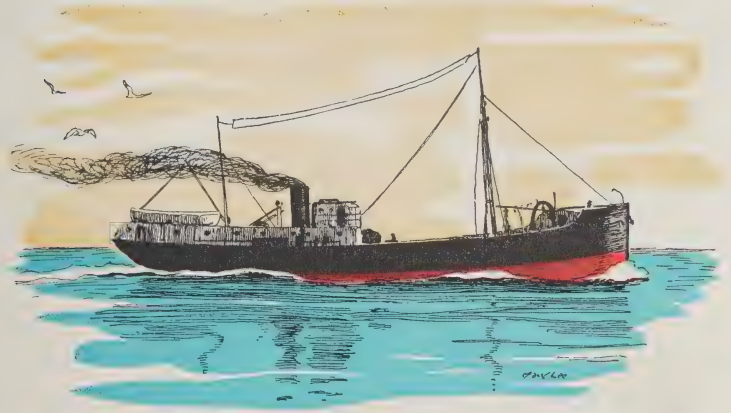
ers. They look almost exactly like the ones that fish for cod. At their sterns they tow big seine boats. We shall see how these are used.

Mackerel seines are large nets, about 125 feet deep and a quarter of a mile in length. Their meshes are about 2 inches square. When the lookout man on the schooner sights a school of fish, the whole crew except one man get into the seine boat. The schooner tows the boat around the school of fish while the men gradually drop the net overboard. Finally they draw the edges of the seine together and form a pocket. The fish find themselves swimming around in a great bag of network. The seine's upper edge is kept at the surface by a line of heavy cork floats, while its lower edge is kept down by lead weights.

The schooner now sails alongside the seine boat, and the men fasten the seine to her bulwarks. The man on the schooner scoops out the fish with a huge dip net worked by an engine. The reason the seine is not hauled on deck is that it is too heavy. Sometimes a seine is found to contain enough mackerel to fill a thousand barrels. If the mackerel are to be sold fresh, they are packed, between layers of ice, in barrels. If they are salted, they are first split and cleaned, and then thrown into barrels of brine.

Now and then you may see a schooner going along quite rapidly, even though she may have no sails set.

You will know that she is moving under the power of an engine, for most schooners are equipped with an engine, which gives what is called auxiliary power. If a schooner has an engine, she can keep on going, even if the wind fails. Also, she can use both sails and engine when she wants to make extra speed.



This picture shows a steam trawler. Notice the frame near the bow from which the vessel tows her nets.

There are also steamships that work as fishermen. When you see a rather good-sized steamer, that has sturdy iron frames shaped like huge staples, sticking up near the bow, you can say to yourself, "That is a steam trawler." The iron frames are used in handling the trawl that the ship tows behind her.

This word trawl used in connection with these steamships means something entirely different from the long lines that we told you about when we ex-

plained the work of fishing schooners. The trawl that steamships use is a large cone-shaped net. It is fastened by heavy steel cables to the iron frames, one on each side of the ship. When set for fishing, its mouth is held wide open by two boards. The ship steams slowly ahead for several hours until the captain thinks the trawl is filled with fish, and then the engines haul the net in and hoist it on deck, where it is emptied.

European countries use many steam trawlers. Great numbers go to the fishing grounds of the North Sea, around Iceland, through the Bay of Biscay, off the coast of North Africa, and to many other places where seas are rough, or where long voyages are necessary. They are the largest vessels engaged in fishing. They have two heavy masts to carry fore-and-aft sails, when needed. The mast near the stern is called the main mast. A sail is almost always kept spread on this mast, because it helps to keep the bow of the vessel pointed toward the wind, and so makes it easier to tow the trawl. Even when moored at the dock, a steam trawler often sticks to her habit of keeping this sail up.

Here is a story that shows how powerful steam trawlers are. Once there was a famous Gloucester fishing schooner named Columbia. In the summer of 1927, she set sail for the Grand Banks of Newfound-

land and was lost with all her crew. No one knows what happened to her; perhaps she was run down in the fog and sunk by an ocean liner, an accident which sometimes occurs. On New Year's Day, 1928, a steam trawler named Venosta was sailing over the fishing banks near Halifax. Her trawl was dragging the bottom of the sea, and at a depth of 240 feet it caught something very heavy. The engines of the Venosta hauled as hard as they could, and by and by first the masts and then the hull of a fishing schooner slowly appeared above the surface of the water. This vessel was recognized. She was the Columbia! The Venosta's steel cables were three inches thick, but they could not hold the great weight of a schooner. Soon they broke, and the Columbia again sank to the bottom of the ocean.

BOOKS THAT YOU WILL ENJOY

"The Story of the Ship."

This is a book of pictures of ships, old and new, many in colors, by Gordon Grant. With each picture are a few lines describing the ship shown.

Other books listed on pages 240 and 275–277, contain chapters that tell about the kinds of ships described in this chapter.

IV. BOATS FOR PLAY

Sailboats

ONE of the greatest of pleasures is going out on the water. Perhaps there is a pond near your home, on which you paddle about on rafts, playing pirates or shipwrecked sailors. Perhaps you go canoeing on a river. If you live near the seashore, you probably often go rowing or sailing, or for a ride in a motor boat. Each of these is great fun. If you wish, you can pretend that, like Columbus, you are setting out on a long voyage of exploration, or that, like the Pilgrim Fathers, you are bound for a new home.

The boat at the left is a catboat, and the one at the right is a sloop.

The first thing to be sure of is that you know how to swim. Then, if you should happen to fall overboard,

or if your boat should upset, there would be little danger of your drowning. You should never go out in a boat until you know how to keep yourself afloat both in fresh water and in salt water. It is not at all hard to learn how if you have a good teacher.

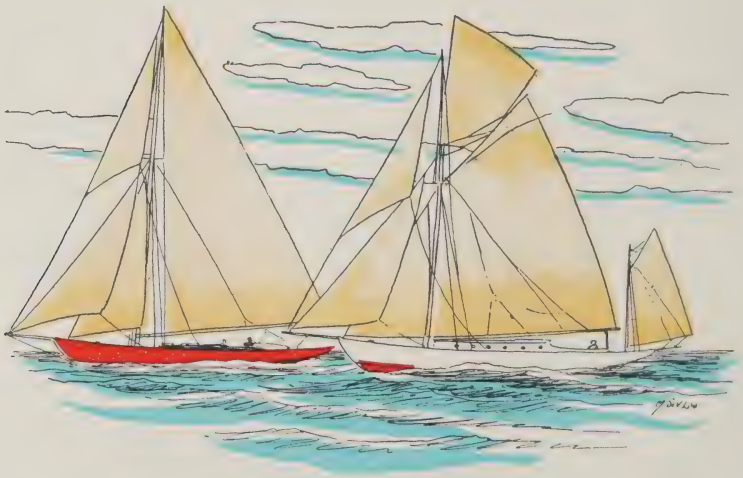
You will also need some one to show you the proper way in which to handle a boat. No book can tell you all about it. You can learn a little from books, and a little from sailing toy boats. But you ought to find some young man or some young woman who will go sailing with you and tell you everything you need to know. Any one who knows how to sail a boat will be glad to teach you.

There are many kinds of pleasure boats, or yachts, as they are called. In this chapter we give you pictures of some of the most common ones, so that, as soon as you see any of them, you can tell what kind of boat it is.

The larger sailing boats have keels to keep them from being blown sideways by the wind. Smaller ones, like catboats, have center-boards, which can be let down into the water through a slit, or "well," in the bottom of the boat, and which act just as a keel does.

The pleasure sailboats that you will most often see are either dories, catboats, knockabouts, sloops, yawls, or schooners. The name depends on the number of masts and the way they carry the sails.

A dory is a small rowboat, with a narrow flat bottom, a pointed bow, and a narrow square stern. If you have one, it will be easy to make a sailboat out of her. About all you have to do is to set up a mast and rig a "sprit sail"; that is, one which has a long wooden sprit to hold up the peak of the sail. Your father will probably know how to do this. Ready-made sailing dories have center-boards, and it will be a good plan if you and your father can arrange one if you rig your own sailing dory at home.



The Bermuda rig is shown on the sloop at the left, and the boat at the right is rigged as a yawl.

Probably the first toy boat you ever made was something like a catboat. If you whittled a shingle

into a point at one end and then stuck in a single mast with a three-cornered sail, it looked a little as real catboats do. A catboat is short and broad, draws little water, and does not tip over easily. Her mast is very near the bow. She has only one sail, the mainsail. She has no jib. Her mainsail may be a "leg-o'-mutton," which has a boom but no gaff, or it may be of the usual shape, with both a gaff and a boom. Some catboats have the "Bermuda" rig, which has a taller mast than usual and a mainsail with a very high peak. You will often see the Bermuda rig on yawls and sloops, too.

A sloop has one mast, set farther aft than a catboat's mast. She has a bowsprit, which a catboat does not have. She carries a mainsail and also a jib, and may have also a topsail and perhaps a flying jib. A knockabout is just like a sloop, except that she has no bowsprit and therefore uses a smaller jib.

The only difference between a sloop and a yawl is that very near her stern a yawl has a second mast, shorter than her mainmast. On it she carries a sail called either a jigger or a spanker. This makes it easier to steer her. The yawl rig is a favorite one on the Pacific Coast, because boats so rigged are easier to handle in the sudden squalls that often strike those waters.

Many sailing yachts are schooners. You already

know how they are rigged. In racing, they carry more sails than schooners that work. If you see one which has triangle-shaped sails, something like small jibs, between any two of her masts, you can say, "She has her staysails set." These sails have this name because, like the jib, they are hoisted upon stays, or the ropes that help to support the masts.

The Yacht America, and Her Cup

ABOUT eighty years ago, there was a world's fair in England, at which there were races of different sorts between many countries. Among them was a race for sailing vessels, the prize being the cup that has come to be known as the "America's Cup." The English had heard that the New York pilot boats were very swift, and they hinted that they would like to have one race against some of their speedy vessels.

The New York Yacht Club built a special boat, however, to take part in this race. She was named America. She was about one hundred feet long and rigged as a schooner with very raking masts. She sailed across the Atlantic, and was then made ready for the race.

On August 22, 1851, she raced fourteen of the fastest British yachts in a course around the Isle of Wight. Among these vessels were a three-masted schooner, six two-masted schooners, and seven sloops.

The America was slow in starting and all the others got away ahead of her. At the finish, however, the America was twenty-four minutes ahead of the second boat. The three-masted schooner came in fifth, three hours and forty-six minutes behind the America.

The America brought the cup home, and it has been in the United States ever since. English yachtsmen have tried over and over again to win it back, but they have never built a boat fast enough to beat any of the American boats that have defended the cup. The names of the American yachts that have won these races are: Magic, Columbia, Madeline, Mischief, Puritan, Mayflower, Volunteer, Vigilant, Defender, Reliance, Resolute, and Enterprise. These races have all been sailed off Sandy Hook, New York, except in 1930, when a course off Newport, Rhode Island, was used.

Before each race, the English challenger, as the boat trying to win back the cup is called, came across the Atlantic under sail. And after the race she sailed home. They have not used the sails that they used when racing, but have had special sails. The Shamrock V sailed home rigged as a yawl rig, which is better than a sloop rig would have been in crossing the wide ocean.

The America had a long life as a yacht and won many races. At last she was forgotten and neglected.

But a few years ago a group of patriotic yachtsmen bought her and gave her to the Naval Academy at Annapolis, where you can now see her.

The winning of the America's Cup aroused an interest in yachting in this country that has been growing ever since. There are yacht clubs wherever there is water enough for boats to sail on, and there are yachts of all sizes and many rigs. Often a foreign country, like Germany or Spain or Sweden, sends sailing boats of different sorts to race with ours. Marblehead, Massachusetts, is a small town, but it has come to be called the racing capital of the country, because so many yachts gather there. It has a beautiful harbor, deep, long, and wide. Outside the harbor there is plenty of sea room for races. Both boys and girls use courses inside the harbor for racing their own little boats. There is also a pond on which races are held each summer for model yachts. In Midsummer Week, each year, hundreds of yachts go to Marblehead, and they make a pretty sight crowding the harbor when at anchor, and covering the ocean for miles while racing.

Sometimes yachts race all the way across the Atlantic. A few years ago, the King of Spain gave a cup as the prize in such a race, and five American yachts took part. It was won by a two-masted schooner named Elena. You can read a very interest-

ing story about the race in a book named *Winning the King's Cup*, by Miss H. G. Bell, a young lady who sailed on the Elena.

The best record across the Atlantic made by a sailing yacht is 12 days and 4 hours. Her speed was about 10½ knots. When the yacht America crossed, she took 21 days. How do these times compare with some of the other voyages and records that you will find in this book?

Steam Yachts and Motor Boats

MANY summer resorts are great yachting centers. When there are races, their harbors are filled with hundreds of pleasure boats of all sorts.

Here we see a steam yacht in the background, and a motor cruiser nearer us.

There are the sloops, schooners, and other yachts that we have told you about. There are also the steam yachts of the millionaires, which are always beautiful vessels, with hulls painted shining black or white, and spotless deck-houses or cabins. Some of them have bows like clipper ships, and masts and funnels with a good deal of rake, so that they look very speedy. Others are built to look more like baby ocean liners. They are all built for comfort, and can take large companies of people on long cruises.

Motor yachts are taking the place of steam yachts, because they are cheaper to run and also cleaner. A yacht that burns coal cannot escape showers of cinders. You will see motor boats large and strong enough to go far out to sea, and you will see tiny ones built only for speeding about close to shore. There are closed boats and open boats, and fast ones and slow ones. Some of them are house-boat cruisers, some are cabin cruisers, and some are raised-deck cruisers. There are also sea skiffs, runabouts, speed boats, sea sleds, and many others.

You can take very comfortable sea trips, long or short as you may choose, in any of the cruiser types. In the speed types you can race about as fast as you can possibly wish. A speed runabout or a sea sled is likely to tear through the water at such a pace that when she hits a big wave, she will send a lot of flying

spray back into the cockpit. If your seat is near the stern, we advise you to wear an oilskin coat. Otherwise you may get a bit wet. But nobody would mind that! Riding in a motor boat is too great a thrill for anybody to care if he does get a little water on his clothes.

The pictures will give you a better idea of how motor boats look than we can give you in words. So we will leave you to find out from them how one is different from another, and why each has its particular name. If you ever get a chance, go to a motor boat show, and find out how the new models are changed from those that you have already seen.

Sailing Toy Yachts

SAILING toy yachts is an interesting and exciting game that can be played wherever there is a small pond. In some cities and towns there are Model Yacht Clubs to which girls as well as men and boys belong. A few of these clubs have built their own special pools. Sometimes the boats used are the little ones that you can buy, but it is much more fun to sail one that you have made yourself.

The model yachts sailing in the races in New York, Boston, Washington, or Los Angeles have hulls, masts, and sails just like those of the big yachts used in real races, except that they are a good deal smaller.

Of these two motor boats the one farther away is a runabout, and the nearer one is a speed boat.

Some of the boats may be as much as five or six feet long, while the full-sized boats in which people really sail are several times as big. Some clubs have prizes, like a little America's Cup. In the races, there are rules that must be followed. You can learn a little about the way to sail real boats if you use toy boats that are only a foot or two long.

The best boat to use in play or races is one rigged like a sloop. You can set the sails and the rudder to make your boat move in any direction that you wish. Then you can push her out into the water where the wind will fill the sails. By watching what the wind does to her, you can decide whether you need to change anything. Then, when the boat comes to the bank of the pond, you can lift her out, fix the sails and rudder, and try again. Often your boat may sail out

into the middle of the pool, where she will dance about and for a long time refuse to come to the shore. A good way to rescue a boat that does this is to have a strong string long enough to reach across the pool. Then you and a friend can each take hold of an end of the string and run along the banks until both of you are in a straight line with the boat. Then let the string down to the surface of the water, so that it will catch against the boat. When it does so, both of you should walk to one end of the pool or the other, while the string draws the boat along to a place where you can reach it.

Toy boats can sail "with the wind" or "against the wind," just as real boats do. It will be worth while for you to notice what happens when you have your mainsail running fore and aft, along the line of the keel of your boat, and also what happens when it reaches out beyond the port or the starboard side of the boat. Sometimes the wind will be so strong that you will need to lower your sail a little. If you can't find out what to do to make your boat sail well, ask some one who sails a real boat to tell you what the trouble is.

Perhaps you are already interested in sailing toy yachts. Have you ever thought of forming a club? Why not find out whether your friends would be interested in doing this?

Ships and Stamp Collectors

ARE you making a collection of postage stamps? If you are, you will of course want to add to it as many as you can of the stamps that have pictures of boats and ships. There are at least eighty countries in all parts of the world that have issued stamps of this sort. The United States has done this, and so have Great Britain, Canada, France, Spain, Portugal, Panama, Brazil, Uruguay, the Argentine Republic, Peru, China, Japan, and many islands in the Mediterranean, in the West Indies, in the Pacific, and in the Indian Ocean. If you look in the catalogue of a dealer in postage stamps, you can find out about others.

The stamps are of many sizes, shapes, and colors, and all of them are unusually interesting. Some have pictures of ancient ships like those of the Egyptians, the Phœnicians, and the Vikings. Some show galleys like the Venetians. Some show sailing vessels or steamships, and others native boats in Australia, Africa, and other parts of the world. Among the famous ships and voyages that these stamps picture are those of Leif Ericson, Columbus, Vasco da Gama, Cabot, Hudson, Cartier, Marquette, the Mayflower, the Clermont, and a number of others.

We have seen several collections of ship postage stamps. One was made by a boy who said that it was

not at all hard or expensive to find the hundred different ones that he has. Another collection is on display in the main office of the State Street Trust Company, in Boston. It is the work of several young men, and contains 831 stamps, or very nearly all that have been issued up to the present time. These stamps have been carefully arranged and labeled, and are attractively framed. If you ever see this collection, you will certainly want to begin to make one as near like it as you can.

Collections of Ship Pictures

YOU will get a great deal of pleasure in making a collection of ship pictures. Magazines and newspapers often print photographs of present-day and old-time steamships, sailing vessels, and yachts. You can cut these out and paste them in scrapbooks. Perhaps you can frame the most attractive ones. If you make a scrapbook, the best plan will be to use a ring binder, which you can buy at a stationery store. As you add to your collection, the leaves can be taken out and rearranged, in case you decide to keep your pictures in alphabetical order, or in the order of dates, or according to the different kinds of ships. It is easier to find the picture of any particular ship, of course, if you arrange your collection by one or another of these plans.

When you can, go to some museum where there are collections of ship models and ship pictures. You will find these in many different cities. Sometimes, too, the decorations in hotels and office buildings include paintings of ships. On pages 255–257 is a list of a few of the places most interesting to visit. Perhaps you know others.

BOOKS THAT YOU WILL ENJOY

"The Picture Book of Ships," by P. Gimmage and H. Craig.
The pictures in this book, many in colors, show the boats and ships of today only. There are short descriptions.

"The Book of the Sea," by T. C. Bridges.
Chapter XVII, "Ships of Pleasure."

"The Jolly Book of Playcraft," by P. Beard.
Pages 41–44, "The Game of Boats."

V. RULES OF THE ROAD AT SEA

Port and Starboard

THE words "port" and "starboard" are used to name the two sides of a ship. When you stand on the deck and face the bow, the port side is on your left hand and the starboard on your right. Have you ever noticed that at night a ship shows a red light on her port side and a green one on her starboard side? It is a rule of the road at sea that every vessel must do this. These lights are carried so that when two vessels meet in the darkness, each one can see which way the other one is going.

Out in the open ocean, when there is a wide distance between two steamers, so that there is no risk of their running into each other, they can pass either to right or left. But where there is little "sea room," as sailors say, like narrow entrances to harbors and channels, the rule of the road must be followed. This rule is the same that automobiles follow on our city streets. Each steamer keeps to the right (starboard) and so leaves the other on her own left (port).

When one steamer wants to cross the path of another which is coming toward her, the steamer that has the other on her own right-hand side must keep out of the way. A steamer always has to keep out of the way of a sailing vessel, whether the two are meeting, passing, or crossing. This is because a sailing vessel depends wholly on the wind, and cannot change her course as quickly as a steamer can.

Here are some jingles that sailors know by heart. They will help you to remember the rules that we have just told you. Learn them, and then try them with toy ships.

Two steamers meeting

When both side-lights you see ahead,
Port your helm and show your red.

You will understand what the second line means when we say that when a ship "ports her helm," she turns her bow toward the right. The helm turns the rudder, and the rudder turns the ship.

Two steamers passing

Green to green or red to red —
Perfect safety — go ahead!

As you move your toy boats about, you will see what this means. Neither boat can run into the other if each keeps its right-hand side toward the other's right. The same thing is true about the left-hand side.

Two steamers crossing

This is the position of greatest danger. Sailors must watch closely — "keep a good lookout," as they say — and use a great deal of care and judgment in steering their ship.

If to your starboard red appear,
'Tis your duty to keep clear.
Act as judgment says is proper —
"To Port!" "To Starboard!" "Back!" or "Stop her!"

But when upon your port is seen
A steamer's starboard light of green,
There's not so much for you to do,
For "green to port" keeps clear of you.

Both in safety and in doubt,
Always keep a good lookout.
Should there be no room to turn,
Stop your ship — then go astern.

Other Lights and Signals

THERE are many other rules about the lights to be carried by vessels of different kinds and sizes. We will tell you a few of those that you are most likely to see in use when you travel on a steamboat.

Every steamship "under way," or moving, must carry both her red and green side lights and a bright white light at her bow, not less than twenty feet above the deck.

If a steamship is towing another vessel, she must carry two white lights, one above the other. If she is towing more than one vessel, she must carry three lights instead of these two; also the steamship and each of the towed vessels must have a white light at her stern.

If a vessel more than 150 feet long anchors, she puts out her side lights, shows two bright white

lights, one high at her bow, and one low at her stern. Smaller vessels show only the light at the bow. Fishing vessels have special kinds of lights.

If a vessel is disabled, she shows two red lights, one above the other on her foremast. If she is aground, she puts out her side lights and shows on her foremast two red lights, with a white one below them.

Whistles

WHEN two steamships approach each other in narrow waters, they may find it necessary to tell each other what they are going to do by means of whistle signals.

A single short blast means, "I will keep to the right." Two short blasts mean, "I will keep to the left." If a steamer means to go astern, or back, she signals by three short blasts. A steamer must answer a signal by repeating it as it was given; that is, if one short blast is blown, she must answer with one short blast. This shows that she understands what the other is going to do. If one steamer comes up behind another and wishes to pass her, she signals by several short blasts. She must not pass unless the steamer ahead agrees to let her, by answering her signal in the same way in which she gave it.

Signal Flags at Sea

IN the old days, before the radio was invented, when ships met at sea and sent messages to each other they had to use flags of different shapes and patterns, and of different colors, blue, yellow, red, and white. Flags like these are still used by sailing vessels that have no radio. Steamships carry signal flags so that they can talk to sailing ships when they meet them at sea. A short time ago a big ocean liner, on which one of the authors of this book was a passenger, met a square-rigger far out at sea. Each ship hoisted a string of gayly colored little flags, and it was a pretty sight to watch them fluttering in the breeze, far above the sparkling blue water.

There is a flag for each letter in the alphabet, and signalmen can spell out any word, a letter at a time. There is a much quicker way of sending a message by flags, because there are ways of arranging a few flags, two, three, four, or more, so that each group stands for a sentence. These sentences are listed in signal books, so that the sailors can read there the meaning of any group of flags hoisted by another vessel. For example, if a ship showed the flags for the letters Q H, it would mean, "Heave to (or stop). I have something important to tell you." The flags for the letters N C mean, "In distress. Want immediate assistance"; and those for D C mean, "We are coming to your assistance."

You will have great fun if you get some pieces of colored paper and paste them together to make flags like the ones on page 78. They ought to be about ten inches square. You can use white paper and colored crayons, if you choose to make your flags small. Then, with your friends, you can spell out messages across the room or between houses. If you wish, you can make up your own codes or lists of the words that you mean when you show any group of letters at one time. If you try to spell words out, you will find that you will need more than one each of several of the letters. After you have worked with them awhile, you will see of which ones, like E, A, O, I, D, N, and R, you will need the most.

Each seagoing vessel has a group of letters that stands for its name. The steamship President Roosevelt, for example, has the letters M D J W. The schooner Reliance, whose home port is Tacoma, Washington, has the letters M D W K. In the same way, each of the ships of our navy, and each of our coast-guard cutters and lighthouse tenders can tell her name by hoisting a set of four signal flags. There are books on all seagoing vessels which contain complete lists of these signals, so that all the captain of a ship has to do is to look in the book and see what name goes with the signal that he sees flying from another ship.

House Flags

WE spoke of house flags in Chapter I. These are flags belonging to the different companies that own steamship lines. Each company makes up its own. We give you pictures of several of the most interesting ones. The house flag is raised to the head of the mainmast when a ship is at the dock, but is never flown at sea.

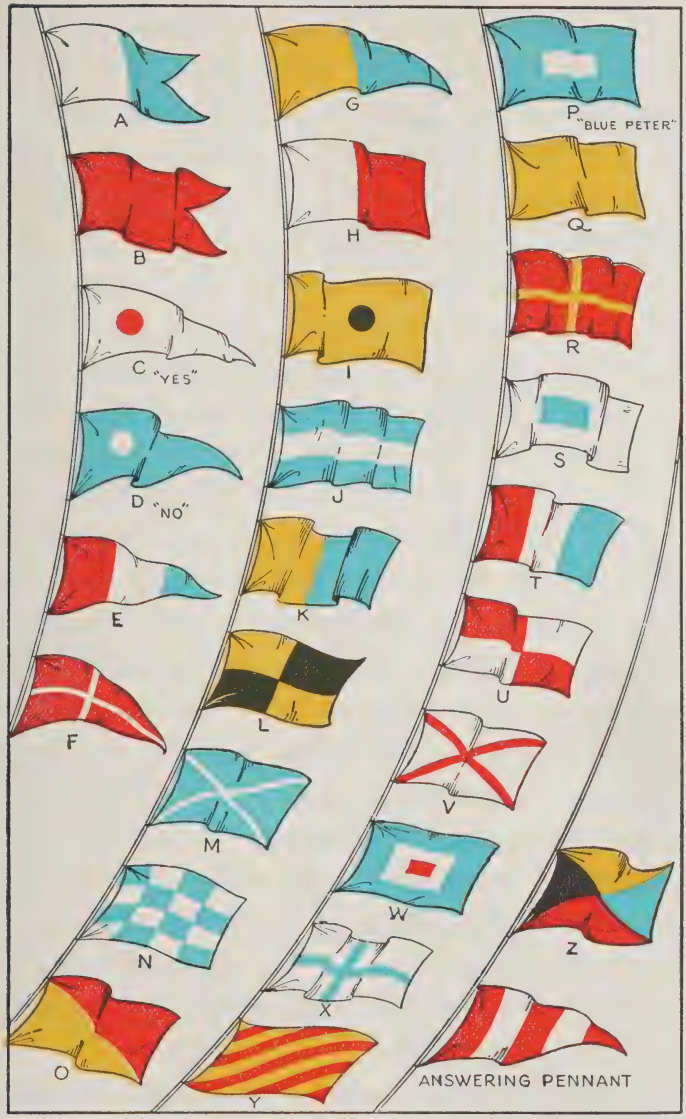
Years ago, ships were likely to be owned by persons as well as by companies, and each owner had his private flag. When a ship got near her home port, she sent news of her safe return from her voyage by hoisting her owner's flag. Watchers on shore would be on the lookout for expected vessels. Through spy-glasses they could see these signals, and then they would run up to the top of a signal mast another flag just like the one on the ship. In this way the news of a ship's arrival would be shown on land perhaps several hours before the ship got into port.

In some seaboard cities there might be a tall tower on a hill that gave a wide view out to sea. In Portland, Maine, for example, there still stands the tall wooden observatory with its flagpoles; and inside, in little boxes along the circular stairway, you can see many private flags of shipowners of more than a hundred years ago. Think how much quicker it is to send a radio message than it was to signal by flags.

These are the House Flags of the following Lines: (1) *The United States Lines;* (2) *The Canadian Pacific Line;* (3) *The Hamburg American Line;* (4) *The Navigazione Generale Italiana, an Italian line;* (5) *The Compagnie Générale Transatlantique, or the French Line;* (6) *The American Line, and the Panama Pacific Line;* (7) *The Nippon Yusen Kaisha, or Japan Mail Steamship Company;* (8) *The White Star Line;* (9) *The North German Lloyd Line;* (10) *The Cunard Line.*

Distress Signals

IF a ship finds herself disabled, either by the breakdown of machinery, by running aground, or through fire, storm, or wreck, she sends out distress signals. Almost always nowadays she can do this by radio, but if a ship has no radio, she calls for help in one or another of the following ways. She can hoist her national ensign upside down, she can fly flags that spell out a message which other ships can read, or she can hoist a square flag with a ball-shaped thing either above or below it. At night she can use certain lights. She can fire a gun or she can blow her foghorn about once a minute. She can send up rockets or make a blaze by burning a barrel of tar or of oil.



These are the signal flags used at sea to spell out messages.

All of these ways are old-fashioned and very slow and clumsy when we think of the speed of radio messages and the way they travel farther than any one can see or hear. You will quite often read in the newspapers how sailors have been in danger of going down with their ship during a storm, and how they have been saved because rescuing vessels have heard their "S O S" calls by radio, and have hurried to them. Let us tell you about two rescues of only a few years ago, when crews would certainly have been lost if they had been unable to call help by radio.

The President Roosevelt and the Antinoe

TWO of the ships belonging to the United States Lines are without doubt among the most famous ships afloat. Neither of them is among the largest or the speediest of the passenger liners; but each has performed a thrilling rescue at sea that will be remembered long after the size or the speed of other ships has been forgotten. These two liners are the President Roosevelt and the America. The same man made each of them famous, Captain George Fried,[1] who was in command first of one liner and later of the other. On each ship he had heroic officers and men to carry out his orders.

On January 20, 1926, the President Roosevelt

[1] The name is pronounced as if it were spelled "Freed."

sailed from New York for Cobh, Plymouth, and Cherbourg. Almost from her first day at sea she had what the sailors call "heavy weather." On January 24th, her radio received a message of distress from the British steamship, Antinoe, a freighter that had lost her way and was having a terrible battle with the huge Atlantic rollers. The message came at about half-past five in the morning. It said,

Do not know position. Noon yesterday, latitude 46.10°N.; longitude 39.58°W. approximately. Been hove-to since.

It was clear that the Antinoe needed help. Captain Fried at once changed the course of the President Roosevelt and headed for the spot in the ocean where he expected to find the British ship. The message told him that the Antinoe had stopped her engines and he knew that the force of the sea would carry her away from the location she had reported. The President Roosevelt therefore used her radio compass, which shows the exact direction from which a radio message comes. After about seven hours' steaming, she sighted the Antinoe right ahead, with fierce waves breaking over her.

The Captain of the Antinoe now sent this message to Captain Fried:

We have not yet properly secured three hatches on account of heavy seas. We have secured steering-gear,

which was damaged. Great difficulty to keep steam on account of sea water in stokehold. Crew twenty-five and sufficient lifebelts. Hope keep afloat until weather moderates. Please will you stand by us. Our grain cargo has shifted, and we have heavy list to starboard. We cannot heave-to satisfactorily, as we cannot maintain sufficient steam.

The wind was blowing sixty miles an hour. The waves were high and rough, and the President Roosevelt was rolling so heavily that no lifeboat could be launched. Captain Fried could only "stand by" until it was possible to send boats to the rescue. Perhaps you know that large quantities of oil poured upon the sea will make the surface smoother. This is often done in a storm at sea. Captain Fried did it now, and the Captain of the Antinoe said afterward that it probably saved his ship from sinking then and there.

The storm grew worse. At about nine o'clock that evening, the President Roosevelt lost sight of the Antinoe. To avoid a collision, Captain Fried had tried to keep his ship about a quarter of a mile away from the other one. The President Roosevelt could not stop her engines entirely, because it was necessary to keep what is called "steerage way." Otherwise she would have been at the mercy of the storm. Even when steaming slowly, she was carried so far away that, in the darkness and storm, she could not

see the ship she was trying to help. The lights of the Antinoe had gone out, and her radio was no longer working. She could send no messages, and for a time it was feared that she had sunk. Captain Fried kept on searching, however, all that night and well into the next day. At last, at nearly four o'clock in the afternoon he again found the Antinoe. This ship was now quite full of water, and it looked as though she must sink at any moment.

Now came a lull in the storm. The President Roosevelt steamed up to within two hundred yards of the Antinoe and again pumped oil upon the sea. Signal flags flying from the Antinoe showed that she was in greater danger than before. Captain Fried called for volunteers for the lifeboat. The boat was launched with Chief Officer Miller in charge, but a great wave hurled her against the liner's side and smashed her. The men were thrown overboard. Five out of seven were pulled back aboard their ship, tired out and covered with oil. Two poor fellows could not be found. Darkness was coming on, and the storm was again getting worse. Every effort was made to save these two brave men, but they were swept away by the angry sea and drowned.

At daylight the next morning, January 26th, Captain Fried saw flag signals on the Antinoe telling that she was in greater distress than ever. The seas

were too high to risk men in a lifeboat, even though more oil was pumped out. But help must be sent to the Antinoe. First, by means of a special gun, Captain Fried tried to fire a life-line. The idea was that the crew of the Antinoe, hauling on this line, could pull over to their ship an empty lifeboat lowered from the President Roosevelt. The gun was fired, but each time the line broke close to the rocket to which it was attached. Next, Captain Fried tried to float across to the Antinoe a cask to which a line was attached. This failed, too. Then a lifeboat was lowered, but without any men in it. This drifted close to the Antinoe's stern, but was upset by a wave before any of her sailors could leap into it.

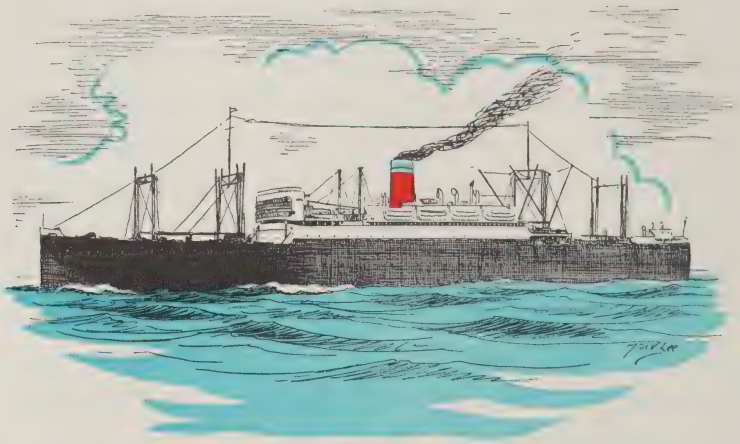
Another attempt to get a boat to the Antinoe, more daring than any of the others, was now made. About midnight, Captain Fried launched a lifeboat fastened to a long line. The other end of the line was made fast to the head of one of the derrick posts near the stern of the President Roosevelt. Then the ship was steered very close around the stern of the Antinoe in the hope that the line could be made to fall across her deck, so that her crew could seize it and haul the boat alongside. This effort called for the most skillful seamanship, because there was great danger of a collision between the two ships. Captain Fried tried this three times, but each time the force of the

sea snapped the line. Finally the boat was lost. After this, the gun was again fired, but without success. Sixteen times the line broke, usually close to the rocket.

To most seamen, it would have seemed useless to make any further attempts to rescue the crew of the British ship. Captain Fried, however, was not discouraged. He was still determined to keep on trying, even though every effort thus far had failed. The next day an army officer among the passengers suggested a new idea. This was to attach a spring between the rocket and line, so that when the gun was fired, the strain on the line would be lessened. This plan was tried, again and again. The seventh time it succeeded. A lifeboat was hauled over to the Antinoe, but before the men could get into her, the line was cut by rubbing against the rail of the ship and this boat, the fourth, was lost.

These attempts had taken all day. Fortunately, the storm was dying down. Shortly after seven o'clock in the evening, it seemed safe to launch a lifeboat with men to row it. The sea was still very rough, and the passage to the Antinoe very dangerous. Chief Officer Miller again was the leader. The men pulled with a will. After a hard struggle they reached the Antinoe. Her men had had no food and no water for two days, so they were very weak. All this time

they had been beaten by the wind and the seas. All of them were wet through, and many were injured. It is no wonder that they were slow in clambering down into the lifeboat. But in the end, twelve were safely taken to the President Roosevelt. The boat was so badly damaged by beating against the side of the Antinoe that she was cut adrift.



The steamship President Roosevelt. Near the stern you can see the derrick posts spoken of in the story. There are derrick posts near the bow also.

Again Captain Fried launched a lifeboat, once more with Chief Officer Miller in charge; and by midnight, aided by a somewhat calmer sea on which the moon was now shining, the rest of the Antinoe's crew were taken off the storm-swept wreck of their ship. The boat used on this final trip was so battered that she,

like the other, had to be cut adrift. An hour and a half later, the President Roosevelt went on her way. She had rescued twenty-five men who faced almost certain death. It had been a long and fearful struggle through four days. While it was going on, the two ships drifted over one hundred miles from the spot where it began. As the President Roosevelt steamed away, signs of another storm appeared. So it is certain that if the Antinoe's men had not been saved when they were, they would have been lost with their ship.

The America and the Florida

ALMOST three years to a day after he rescued the seamen of the Antinoe, Captain Fried had another adventure. He was now the commander of a larger steamship, the America. On January 23, 1929, while coming home from Europe, the America picked up on her radio an S O S call from an Italian freighter, the Florida. It was during a storm, about seven hundred miles off the coast of Virginia. The America started for the spot where the Florida said she was, but, as had happened in the case of the Antinoe, the storm-beaten ship was finally found some distance away from the position she had reported. Two other ships had heard her call for help, but, after searching in vain for eight hours, they had been forced to give up the hunt. It was only by

means of her radio compass that the America was able to find the Florida.

After steaming nearly five hundred miles, the America came within sight of the Florida. It was now about half-past six in the evening. There were roaring seas, lashed by a snowy gale. The Florida's bridge and her rudder had been washed away and she had listed so far to one side that her captain feared that she would roll completely over. Her crew had been almost stripped of their clothing by the waves that beat over the ship, and by the wind that lashed them with ice and snow. They had had no food, except a little fruit, for four days.

Captain Fried and his men well knew the danger in trying to rescue these men, but no one hesitated. A lifeboat was launched, and Chief Officer Manning took command of it, with eight men at the oars. The searchlight of the America was thrown upon the Florida. In spite of the wind and waves, Manning succeeded in getting his boat within fifty feet of the ship he was trying to help. The Florida was rolling and plunging heavily among the great waves, and her deck was almost awash. The boat's crew threw a rope to the sailors on the sinking wreck. One after another these men slid down into the sea and by means of the rope pulled themselves hand over hand to the little boat that was their only hope of life.

Suddenly the rope broke, and one man, halfway to safety, had to be dragged back to his ship. Immediately another rope was thrown to the Florida, and all her crew were taken off. The captain left his ship last of all. That is a rule of the sea, and it is always followed.

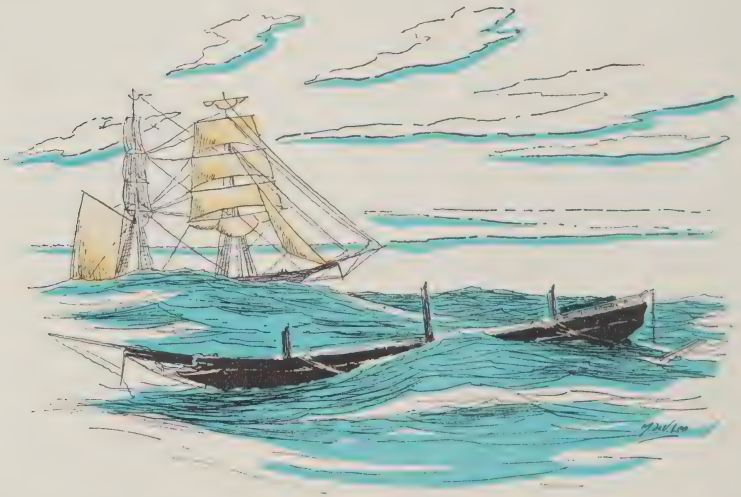
Many rope ladders had been strung down over the tall side of the America, but when the heavily loaded little lifeboat got back to the ship, not one of the thirty-two rescued seamen had strength enough to climb them. The waves were so high that Captain Fried saw that it was unsafe to try to hoist the boat on board. Home-made breeches buoys, therefore, were lowered, and all the men were hauled safely up to the deck of the America. The work of rescue had taken only about two hours.

These two stories given you an idea of the power of the sea in times of storm. They show you also how a skillful captain can handle his ship, and how brave sailors are always ready to go to the rescue of others in distress.

Derelicts

DERELICT is the name given to ships whose crews have deserted them in mid-ocean, so that they drift around helplessly with no one to steer them. Usually they are old wooden sailing vessels,

but once in a while, a big steamship becomes a derelict. In many cases they are loaded with lumber, which, being lighter than water, keeps the ship from sinking. There is hardly a place in the ocean where they are not found; and while most of them are on the North Atlantic, there are many off the shores of California and of China. The reason that derelicts collect in certain places is that they are swept along by currents of water that flow through the ocean toward these places.



Here a brig has hove-to, or stopped, by backing the sails on her mainmast. She has stopped to see whether there are any men on the derelict.

Derelicts are one of the greatest dangers to ships at sea. They have usually lost their masts and have sunk

so low into the water that they cannot be seen very far away. A swiftly moving steamship may run into one without seeing it at all. Many ships have been wrecked in this way. The captain of any vessel who sees one must report, at once, where and when it was, in order that it may be destroyed. Our Government has a patrol of coast-guard cutters whose duty it is to look for derelicts and blow them up, or sink them by gun-fire. In a single year, not so very long ago, these little ships rid the ocean of nearly fifty dangerous derelicts.

Why should a crew ever desert their ship and leave her to become such a peril to other sailors? Sometimes there is no real reason. Once in a great while a vessel is found at sea in perfectly good order, but without a soul aboard. No one ever finds out what frightened the crew so badly that they fled from their ship. If such a vessel can be towed to port, the crew of the ship that brings her in is paid a large reward. Almost always, of course, no crew will leave their ship at sea until it is certain that she will float no longer. There are times, however, when a ship that seems to be on the point of sinking does not go to the bottom for many months. Her crew may leave her and save their own lives, either by taking to the lifeboats or by being rescued by some passing vessel. Their poor old ship becomes a derelict and is carried about the seas

by winds and waves until some cutter puts an end to her.

Ocean Currents

DERELICTS often drift into parts of the ocean far distant from the spot where their crews deserted them. The reason is that they get caught in moving currents of water, which flow through the ocean like great rivers, and are carried along in them. One ship was left by her crew about three hundred miles from Newfoundland. Two or three months later, in November, she was seen three hundred miles farther south. In February, another ship reported her three hundred miles eastward. Ocean currents continued to carry her about, until finally, in July, she was found between the Canary Islands and Portugal. Another derelict was hunted by coast-guard cutters all the way from Florida to Ireland. She was sighted by different ships more than fifty times, but the ocean currents kept moving her so fast and so far that the hunt lasted several months. There are many other strange stories about derelicts, how long they stayed afloat and how far they drifted. If you wish, you can read some of them in Bridges' *Young Folks' Book of the Sea.*

There are two kinds of ocean currents, one warm and the other cold. The warm currents start near the

equator, and the cold ones, like the Labrador current, start in the far north, or the far south. It may sound odd to you to hear of rivers flowing through bodies of water like the ocean. You might think that rivers could flow only between banks of earth. It is true, however, that for a long distance a current like the Gulf Stream is almost as clearly marked in the ocean as the Mississippi River is on the land. The waters of the Gulf Stream are deep blue, quite a different color from the grayish-green of the Atlantic. Its waters are also warmer, and more salty. The heat of its waters raises the temperature of the air above it. When you are on the ocean bound for Europe, you can tell, both by the color of the water and by the warmth of the air, when your ship is in the Gulf Stream.

This stream is the largest and most important current in any ocean. It would take three thousand rivers like the Mississippi to carry its waters. Where it starts, it is about fifty miles wide and two thousand feet deep, and flows at the rate of about three miles an hour. Out in the ocean it spreads out like a fan, and its speed becomes less. It starts in the Gulf of Mexico, where the water is heated by the blazing hot sun of the tropics. Then it flows into the Atlantic between Florida and Cuba, and along the coast of the United States toward the northeast. Between

our shores and the Gulf Stream there is a narrow strip of cold water. The Gulf Stream then turns toward Europe, and as it nears the other side of the ocean, it divides into two parts. One goes north along the western coast of the British Isles, and the other goes south toward Africa. The warm waters from the Gulf Stream that flow into the oceans north of Europe keep some of the harbors there always free from ice, even though these places are very far north. Thus it is a great aid to shipping.

In the Pacific Ocean there is a warm current, something like the Gulf Stream, although not so large and not so clearly marked. It starts near the Philippine Islands and flows up past Japan and then across toward North America. Near the California coast it divides, part going toward Alaska and part southward. The waters that flow close along the shores of California are one reason why the climate there is warm. Do you understand why? In the same way, the Gulf Stream makes the climate of the British Isles warmer than it would otherwise be. Can you explain why the Gulf Stream does not have the same effect along our Atlantic Coast?

BOOKS THAT YOU WILL ENJOY

"The Seascout Manual."

A great deal of information needed by all young sailors.

Some of the other books listed on page 122 contain chapters that tell about the things described in this chapter.

VI. SAFETY AT SEA

When Crew and Captain understand each other to the core,
It takes a gale and more than a gale to put their ship ashore;
For the one will do what the other commands, although they are chilled to the bone,
And both together can live through weather that neither could face alone.
From Kipling's poem "Together"

The Captain

ON an ocean steamship, everything is done that will give the greatest possible safety to the ship, the people on board, and the cargo. In the first place, the captain or one of his officers always stays on the "bridge" to see that the ship is steered on the right course, and that everything is working as it should. The officers have the most modern compasses and instruments to help them find out, by looking at the sun or stars, just how far north or south of the equator the ship is. Another instrument helps them find out the position east or west of the meridian of Greenwich. They have a chart, or map, of the ocean on which they keep a record of the ship's exact position at all times, and on which they mark a line to show the direction in which she is plowing her way. They have other maps, published by the Government every month, that show the prevailing winds, the ocean currents, the location of dangerous rocks, stormy places, and so on. They have a machine called a "log" that tells them how fast the ship is moving. They have all sorts of other devices that help them keep track of the many things they must know in order to control the ship properly.

On the bridge are speaking-tubes and electric wires by which the captain can send orders to any part of the ship. There are also sets of tubes that reach down into the lower decks and bring warning of leaks or of fire. Every ocean liner has a double bottom, so that if her outside shell is pierced, the water cannot get inside the inner one. Between these two shells are crosswise walls, so that the space between the two bottoms of the ship is divided into many small rooms. If water gets into any one of these, a signal is sent, and the captain knows where to have repairs made.

All the lower decks have heavy steel bulkheads running from one side of the ship to the other. This adds to safety in several ways. It makes the ship stronger, and it makes it possible, by shutting the doors in these bulkheads, to keep fire or a bad leak from spreading through the ship. Sometimes, if a ship runs into another one, or if another one runs into her, she may be so badly smashed that there will be a hole through both her outer and her inner hull. If fire breaks out anywhere in the hold, smoke is carried through a tube to the captain's bridge. He can tell by looking at an indicator the exact spot to which the fire brigade should be sent. An electric fire alarm, something like those ashore, tells if there is fire in a cabin, in one of the public rooms, or in any other part of the ship.

The Watches

ON shipboard, a careful lookout is always kept. The crew is divided into two groups, or "watches," as they are called. One group is on duty for a regular time while the other group rests. Of the men on duty, some are busy with different kinds of work, such as the radio men, the engineers, and the deckhands. Others, posted at the bow of the ship and at other places, are always looking out over the sea, so that they can give prompt warning of any danger or of some other vessel in distress.

Do you know how to tell time as it is done on shipboard? For example, what time is "six bells"? You may say "six o'clock," because this is the way the clocks in your home strike. But on shipboard six bells is either three o'clock, seven o'clock, or eleven o'clock. We will explain this. You see, the ship's day is divided into seven watches, five of four hours each and two of two hours each. Together these make up the twenty-four hours of a day. The first watch begins at 8 in the evening and ends at midnight. The middle watch is from midnight to 4 o'clock in the morning. Then come the morning watch — 4 to 8 A.M.; the day watch — 8 A.M. to noon; the afternoon watch — noon to 4 P.M.; the first dog watch — 4 to 6 P.M.; and the second dog watch — 6 to 8 P.M. The purpose of the two

dog watches is to change from day to day the hours of each man's work. If there were only one watch instead of two between 4 and 8 P.M., the same men would be on duty during the same hours each day. Half an hour after each of the four-hour watches begins, "one bell" is struck. Whenever "eight bells" are struck, the men on watch go off duty and others go on. At the end of the first dog watch, however, four bells is the signal for the new men to go on duty. On the forecastle there is a bell like a locomotive's, and every half-hour a man is sent to strike it the proper number of times. The strokes are not made one quickly after another, as clocks ashore strike, but in this way — groups of two strokes with short pauses at the blank spaces:

2 bells . .
3 bells . . .
7 bells . . . . . .
8 bells . . . . . .

Each hour is shown by an even number of strokes, and each half-hour by an odd number. The reason for having the ship's bell strike differently from clocks on land will be clear when you recall that if in the middle of the night you heard an ordinary clock strike once, you could not tell whether it was 12.30, or 1, or 1.30 o'clock.

Here is "ship's time" for a full day:

SHIP'S TIME

First Watch	P.M.
1 bell	8.30
2 bells	9.00
3 bells	9.30
4 bells	10.00
5 bells	10.30
6 bells	11.00
7 bells	11.30
8 bells	Midnight

Middle Watch	A.M.
1 bell	12.30
2 bells	1.00
3 bells	1.30
4 bells	2.00
5 bells	2.30
6 bells	3.00
7 bells	3.30
8 bells	4.00

Morning Watch	A.M.
1 bell	4.30
2 bells	5.00
3 bells	5.30
4 bells	6.00
5 bells	6.30
6 bells	7.00
7 bells	7.30
8 bells	8.00

Day Watch	A.M.
1 bell	8.30
2 bells	9.00
3 bells	9.30
4 bells	10.00
5 bells	10.30
6 bells	11.00
7 bells	11.30
8 bells	Noon

Afternoon Watch	P.M.
1 bell	12.30
2 bells	1.00
3 bells	1.30
4 bells	2.00
5 bells	2.30
6 bells	3.00
7 bells	3.30
8 bells	4.00

First Dog Watch	P.M.
1 bell	4.30
2 bells	5.00
3 bells	5.30
4 bells	6.00

Second Dog Watch	P.M.
5 bells	6.30
6 bells	7.00
7 bells	7.30
8 bells	8.00

The Lifeboats

THE crew of a steamship often has practice in launching the lifeboats, and each passenger and sailor is told which boat he is to get into in case it be-

comes necessary to leave the ship at sea. On the topmost deck, along the two sides, there are rows of lifeboats and rafts. In all there are enough to hold all the people the ship can carry. Each is marked to show the number of people it will hold. All have sets of oars, a short mast and sails. Some of the largest boats have engines, and small cabins with electric lights and heat. In metal boxes with airtight and watertight covers each lifeboat and each raft carries a supply of pilot bread crackers, and in casks each carries drinking water. There are also matches, lamps and oil, red fire for signaling, buckets for bailing water out of the boat, axes, and other things sure to be needed by any people who have to trust themselves to small lifeboats at sea. Along the side of each boat and each raft runs a rope, fastened in loops, which people who may have fallen into the water can grasp until they are helped into the boat.

The most modern ocean liners, like the President Hoover, carry motor lifeboats equipped with radio transmitters. The instruments send out S O S calls that can be heard for a hundred miles.

Radio

RADIO is a wonderful help to ships at sea. If a ship is disabled, she sends out a radio call for help. She telegraphs the three letters S O S and

tells her name and her position. Near-by ships that receive the message rush to help her, and, if she is close to shore, land stations broadcast her message and call coast-guard cutters. Here is the way the letters S O S sound in the dots and dashes of the telegraph code: ··· −−− ··· You see that it is one of the simplest and clearest signals to send. You can find the complete alphabet of the International Morse Code in the *Boy Scouts' Handbook*, if you are interested to know how the other letters are represented.

Ships in the North Atlantic receive radio warnings from the cutters of the iceberg patrol. From some lighthouses or lightships they can receive fog warnings, and signals that help them to figure out their own positions on the ocean if they cannot do so from the sun or stars. There are also the everyday uses of radio, such as hearing from shore all the important news, which is printed in the ship's daily newspaper.

Pilot Boats

THE captain of an ocean steamship almost never trusts himself to steer his vessel out of a port or into one. He depends upon a pilot. This man has a small sailing vessel or motor boat in which he goes back to shore after he has guided an outgoing ship a little way out to sea, and in which he meets an in-

coming ship some distance from the port. When you sail to Europe, the pilot, after finishing his work, clambers down a rope ladder hanging over the side of the great steamship, steps into his rowboat, waves his cap, cries out "Pleasant voyage," and is rowed back to his vessel. When you come back from abroad, the little pilot boat meets your ship and sends the pilot aboard with a cheery greeting of "Good-day, Captain." Then this skillful man takes the captain's place on the bridge and guides the ship into the harbor and up to her dock.

BOOKS THAT YOU WILL ENJOY

"The Book of the Ocean," by E. Ingersoll.

Voyages, ships, sailors, ocean currents, and other stories about the sea.

"Seagoing Vessels of the United States."

This is published by the Government Printing Office. It gives colored pictures of the flags of all seaboard countries, signal flags, house flags, and funnels.

"The Young Folks' Book of the Sea," by T. C. Bridges.

Chapter XVI, "Dead Ships" (derelicts).

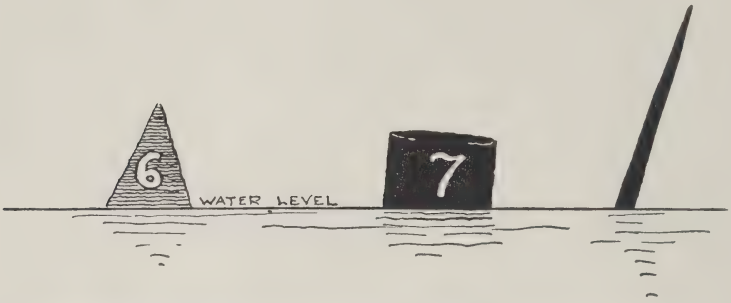
VII. MAKING OUR SEACOASTS SAFE

Buoys

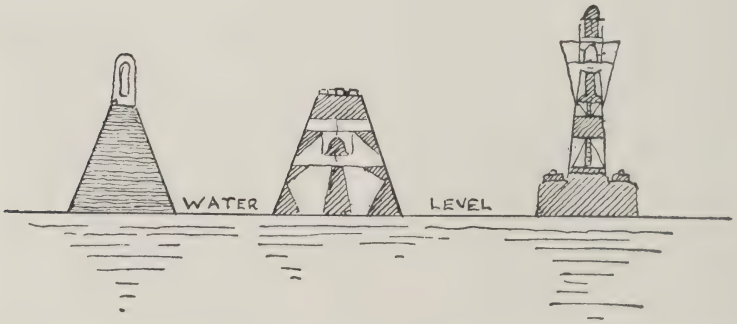
IN going into a harbor or out of one, the pilot follows the line of buoys marking the channel. In a harbor, and for some distance outside also, you will see buoys of different sorts floating on the water or sticking their heads above it. All of them are anchored so that they will stay in one place. There are several kinds, such as whistling buoys, bell buoys, spars, cans, and nuns. The pictures show you how they look. Whistling and bell buoys usually are farther out than the others, and mark hidden rocks and shallow water. They whistle or ring as they are tossed about by the waves.

When you come closer to the entrance to a channel, you find the other kinds of buoys. Those on the starboard side of your ship, as you come in from sea, are painted red and bear even numbers, 2, 4, 6, and so on. They are usually nun buoys. On the port side are can buoys, painted black and bearing the odd numbers, 1, 3, 5, and so on. Can buoys that are painted green, or that are circled with stripes of red and black, mean that there is a wreck or some other dangerous thing on the bottom. Vessels should not pass too close to them. If can buoys are painted with up-and-down black-and-white stripes, their position marks the middle of the channel. Vessels should pass very close to them. Spar buoys, properly

colored, are likely to be placed on either of the two sides of less important channels.



The names of these buoys, from left to right, are nun, can and spar.



This drawing shows a whistling buoy, a bell buoy, and a buoy with a gas light.

There are also buoys that carry lights at night. These work in the same way that the traffic lights called silent policemen in our cities do. They are very helpful in guiding vessels through a channel during the hours of darkness.

Lighthouses

ALMOST twenty-two hundred years ago, the Egyptians built the first lighthouse that we know anything about. This was called the Pharos. It stood at the port named Alexandria, in honor of Alexander the Great. It was a huge stone tower probably four hundred or more feet high. In a big iron basket on the top burned a bonfire of wood or coal, but the flames could not have been seen very far because of the smoke. Nowadays every seacoast in the civilized parts of the world is lined with lighthouses, in which are very powerful lanterns whose beams are magnified by lenses and thrown by reflectors so that they can be seen many miles out to sea. As you sail along our own coasts, you will never pass out of sight of one lighthouse before you come within sight of another. Often several can be seen at one time. They warn ships of dangerous rocky coasts and of shallow water. They also furnish sailing marks, so that a ship can easily find her way, even at night, to the harbor or channel to which she wishes to go.

A lighthouse may stand on a high headland on shore, or on an island or ledge some distance out in the sea. Those near the entrances to harbors need not be very tall. Some are such short, squat towers, with spidery legs reaching down into the water, that they

are nicknamed "bug" lights. Usually, however, a lighthouse is quite tall, because the higher it is above the water, the farther off its beams can be seen. Most lighthouses are painted white, because that color shows a long distance away. Some are painted black or red or brown, in order to stand out clearly in daylight against the sky or a light-colored background. Others have special colored bands, so that sailors can tell quickly just what lighthouse any particular one is.

Lighthouses differ, also, in the color of the light that they send out, and in the way they show this light. There are many lighthouses that burn red lights and a few that burn green ones, but the most common color is a clear brilliant white, because this can be seen at the greatest distance. Some lights are "fixed," which means that they shine steadily and brightly all night long. Others "flash"; that is, the lens revolves in such a way that the light is thrown out every few seconds with instants of darkness when no light shows. Sometimes it is arranged to give first a very bright flash and then a dimmer one. There are all sorts of ways of making the light shown by one lighthouse different from that shown by others. Sailors learn these differences and can tell the moment they come within the range of a light what its name is. Nearly all lighthouses have also big foghorns, driven

by machinery, whose warning blasts can be heard for long distances.

Lighthouses have to be very solidly built because they are exposed to fierce gales and the constant beating of the waves. Some have to bear the pressure of great masses of floating ice. Their towers are most often round, or nearly so, because this shape gives less surface for the wind and seas to strike upon. Nearly all the older ones, built of stone or brick, grow gradually narrower toward the top, for the same reason. Modern ones are built of concrete, cast iron, or steel, and have foundations bolted into solid rock.

If a lighthouse stands on the mainland, its keepers do not lead a very lonely life, although they have to be on duty every night, in order that the light may not fail to shine. In the lighthouses that are placed on reefs, however, some distance out at sea, the life of keepers is not only lonesome, but in time of storm dangerous. Usually there are three men in the crew. Every six weeks or so, each of them in turn is given a vacation of two weeks. They are taken back and forth in a lighthouse tender which calls regularly to bring them supplies and to see whether any repairs to the lighthouse and its machinery are needed. Now and then a storm, with strong winds and heavy seas that last several days, makes it unsafe for the tender to approach the lighthouse. Then the keepers have

to get along as best they can until the weather becomes calm again.

In all there are more than three thousand lighthouses along the shores of the United States. Some of the best-known are those at Minot's Ledge, near Boston; Spectacle Reef, near the straits of Mackinac in Lake Huron; and on the Pacific, Tillamook Rock, twenty miles south of the Columbia River. There is a great tower at Barnegat, New Jersey, which has a light so powerful that if it were not for the curved surface of the earth, it could be seen by sailors one hundred miles at sea.

Two poems about lighthouses that you will enjoy reading are Longfellow's "The Lighthouse," and Celia Thaxter's "The Watch of Boon Island."

Lightships

SOMETIMES it is not possible to build a lighthouse at a spot where a warning light is needed. At these places we have lightships. The one off Nantucket Island, Massachusetts, is twenty-six miles from land, farther out to sea than any other lightship in the world. When the liners bound to New York from Europe pass this little red ship bobbing about on the ocean swell, she looks very tiny indeed, very lonesome, and an uncomfortable place in which to live. The crew who man her must be glad to hear the

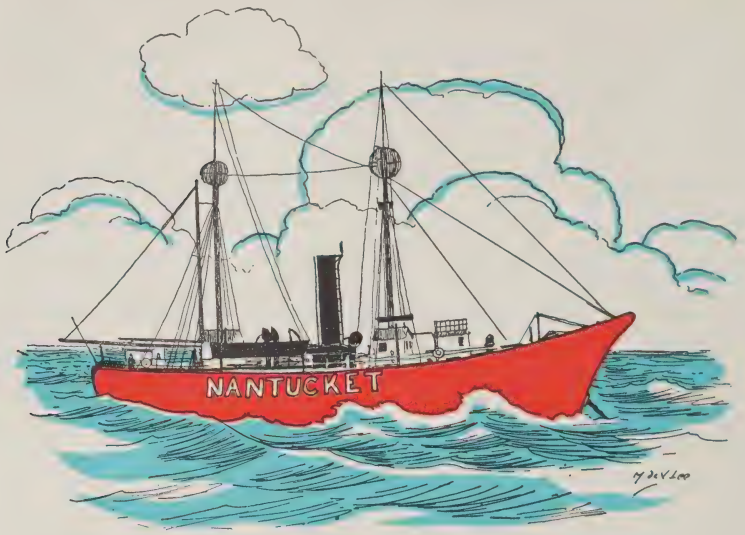
friendly salute of the liner's whistle, and they must look forward eagerly to the visits of the lighthouse tender and the chance to get back to solid earth once in a while.

Lightships are about the same thing as floating lighthouses. They carry big lanterns in a sort of cage at their masthead, and have powerful foghorns. There are fifty or so of these lightships belonging to the United States, and each is painted either red or yellow, with its name in very large white letters along its sides. Every so often a lightship has to be taken into port for repairs, but the spot is never left without a light. Another vessel as much like the regular one as possible always keeps a light burning while any lightship has to be taken away from its post.

If you ever have a chance, you ought to visit either a lighthouse or a lightship. It will be very interesting to learn all the keepers will tell you about the lanterns, the foghorn, the lifeboat, and whatever else you may find to ask questions about. You will be proud to know the faithful men who spend their lives helping to make the sea safe for ships.

The Coast Guard and their Lifeboats

HAVE you ever been to the top of a lighthouse, 100 feet above the level of the sea? Do you know how far out over the ocean you could see from



A lightship is really a floating lighthouse. She goes to port only for repairs and while she is away from her post another ship takes her place.

this height? It would be almost 11½ miles. The higher you go, the farther you can see. Even at only 20 feet above sea level you can see a ship more than 5 miles away, and at 40 feet you can see about 7¼ miles. Perhaps you have driven along a beach or a cliff at the seashore. If you have, you have probably seen some of the life-saving stations of our coast guard. In these little houses live a keeper and a crew of seven or more men. Near at hand there is a tower, not as high as a lighthouse, but high enough to give a wide view out over the ocean. A man always stays on watch there,

looking for ships that have got into trouble or that are sailing into dangerous waters. If a ship needs a warning, signals are sent from the station. If one has run aground, the men of the coast guard launch a surf boat, and go to the rescue. If the lookout man sees a vessel far out at sea that needs help, he telephones to the nearest radio station, which sends out a broadcast message. Then the nearest cutter of the coast guard rushes to the ship in distress.

Life-saving stations are located at all the dangerous places along our coasts. In all there are nearly 300, and they are scattered along the Atlantic, the Gulf of Mexico, the Great Lakes, the Pacific, and the shores of Alaska. There are some on our great rivers, like the Mississippi and the Ohio. Sometimes, on the seacoast, the stations are only 5 or 10 miles apart. This makes it possible for the men constantly to patrol those parts of the coast along which passes a procession of vessels on their way to the great cities.

In spite of the lighthouses and lightships, there are shipwrecks, or vessels that have run aground because of fog or storm. The coast guard saves from these many people who otherwise would have drowned. Almost every year the number saved is more than 1400. At each station of the coast guard there are from 2 to 5 surf boats. These can be launched through the heaviest waves and can ride the highest

seas. They have gasoline engines which can drive them at a speed of 8 or 10 knots. They have also sails and oars for use if needed. These boats have airtight compartments and so can never sink. Very heavy iron keels help them turn right side up again if they are overturned by the sea. They are "self-bailing," which means that they have an arrangement for emptying themselves if dashing waves fill them with water. Some of them are big enough to carry 40 people, but most of them can carry only about 20.

Each boat carries a small cannon for shooting light ropes to a wreck which the boat cannot reach, also life buoys, rockets for night signaling, and other things necessary in rescue work. One of these is the "breeches buoy." The name gives you a little idea of how it is shaped. It is big enough to hold one man, and travels back and forth on a sort of trolley line. Each surf boat carries a breeches buoy. First a light rope is shot across to the wreck. Its crew haul this rope in and find fastened to it the heavy trolley line for the breeches buoy to run on, and the breeches buoy itself. Then the two ends of the trolley line are made fast, one on the wreck and the other on the surf boat, and one man after another is hauled to safety. Sometimes, of course, the wreck is right on the beach or at the foot of the cliff. Then the surf boat does not need to be launched, and the breeches buoy is worked from the shore.

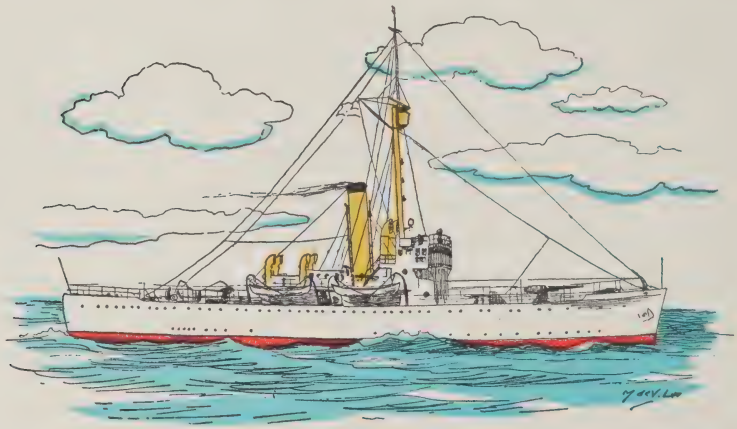
Coast-Guard Cutters

THE coast-guard cutters are good-sized steamers, which look a good deal like the gunboats in our navy. Since they can carry large supplies of fuel, food, and water, they can stay at sea for a long time. They cruise along all our coasts performing many duties. They go also to our islands in the West Indies, to Alaska, and to the Hawaiian Islands. They tow to port vessels that have been disabled, frequently from as far as eight hundred miles out at sea. They rescue shipwrecked seamen. They sail with our fishing fleets to the waters of Newfoundland and Nova Scotia to help any fishermen who may get lost or who are sick or injured. On the Pacific Coast the cutters see that the law about catching seals only in the proper time of year is obeyed. On the Mississippi River specially built cutters for use in very shallow water have helped the people who have suffered from flood. On the Great Lakes, until the water freezes over, they cruise about doing whatever they can to aid ships and sailors.

The Iceberg Patrol

NOTHING that our coast-guard cutters do is more important than the iceberg patrol in the North Atlantic Ocean. Icebergs are huge mountains of fresh-water ice that break off from the glaciers in

Greenland and float down the coast of Labrador, carried by an ocean current into the Atlantic. Glaciers are rivers of solid ice that fill the valleys in this frozen part of the world. Sometimes they are thousands of feet deep. They crawl along between



Our Coast-guard cutters are very trim-looking vessels.

the mountains, inch by inch, perhaps not more than a foot in a whole year; and when they reach the edge of the sea, great masses crash off and float away. If you put a piece of ice into a tumbler of water, you notice that there is much more of it below the water than there is above it. In just this way, icebergs that show perhaps 300 feet above the ocean have 3000 feet or more of ice below the surface. Icebergs are very irregular in shape, so that a ship cannot safely go near

one. There is great danger that if she does she will strike on the under-water ice and be wrecked. Many icebergs contain millions of tons of ice. Sometimes they are several miles long. One that contained 1,000,000 tons would be about 20 times as big as the largest steamship in the world. You can see what a danger to shipping these icebergs are. Nearly half of every year there is thick fog covering the sea in which they float, so that ships cannot see them. Many years ago, ships often ran at full speed against icebergs and were dashed to pieces and sunk. No one can tell how many lives were lost in this way.

From March 1st to July 1st, three of our coast-guard cutters cruise about in the northern seas where there are the most icebergs. They do so because the busiest ocean route in the world and the busiest fishing grounds lie right in the path that the icebergs follow, and it is necessary to safeguard the ships. Similar cutters from other countries share this work. They come from Canada, Belgium, Denmark, France, Germany, Great Britain, Italy, Holland, Norway, and Sweden to warn and protect the ships of the whole world. This patrol has been kept up for the last 14 years, and in all that time not a single vessel has been wrecked by an iceberg. The coast-guard cutters keep track, not only of all the icebergs, but also of the whereabouts of all ships within 400 miles. They blow

up some of the icebergs with dynamite. They send radio messages to warn the ships away from dangerous parts of the ocean, and they answer all the questions that the ships ask. Sometimes a cutter will talk to as many as 38 ships in a single day. The same sort of work is done by American cutters in the Pacific. Each day during the season of danger from icebergs, these ships are on patrol somewhere between Alaska and the islands in mid-ocean. They may be called the traffic officers of the sea, for they direct and help ships very much as the policemen in our cities direct automobiles.

The Navy in Times of Peace

THE ships of our navy have plenty to do in times of peace. Most of us have seen one or more of them lying in the harbor of a seaport, where they have been sent to take part in some celebration. At other times they are called on to help the iceberg patrol, to rescue vessels in distress, or to destroy derelicts. Often they are hurried to near-by or to distant parts of the world where there have been fires or floods, earthquakes, or volcanic eruptions. There they take people to places of safety, and help them in other ways.

Sometimes one of our smaller naval vessels stays abroad for a year or more, going from one part of the world to another, as she may be needed. When she sails for home, she hoists a narrow "homeward bound

pennant" of red, white, and blue. This may be long enough to reach the water, for it is as many feet in length as there are men in the ship's crew. If there are 200 men aboard, the pennant is 200 feet long. On the blue part, there is a star for each officer aboard. So, if you ever see a United States cruiser steaming into a home harbor with a long pennant whipping out astern, you will know that she has been on foreign service for at least a year.

Everybody is glad to see one or more of our trim gray naval vessels come into a harbor, whether the visit is to bring help or is just a friendly call. Usually there are visitors' days during the ship's stay, when guides take you over the ships and explain the engines, searchlights, guns, and machines. You can learn a great deal in talking with any officer or "bluejacket" as the sailors are called.

A visit to any naval vessel will be worth while. Some of you, who like machinery, will find a submarine the most interesting, because these little ships are filled with all sorts of machines. You will wonder how the crew can understand them all, and how they can live in their crowded quarters.

You will be greatly interested in the airplane carriers. Two of these, the Lexington and the Saratoga, which are named for battles fought in the Revolutionary War, were planned to be "battle cruisers."

This is the name for very fast powerful fighting ships, which are only a little less heavily armed than "battleships." But when the United States, the first of all the countries in the world to do so, decided to have a small navy, the Lexington and the Saratoga were made over. Instead of being heavily armored and fitted with big guns, they were made into seagoing airports, each carrying about 70 airplanes. Their topmost decks are long and wide, with the funnels, masts, and deck-houses at the very edge, so that the airplanes can take off and land just as they can on a large field ashore. These ships are almost as speedy as destroyers, being able to steam at nearly 34 knots. They are 888 feet long and 106 feet broad, which makes them larger than our largest battleships. They have very powerful engines, and the Lexington recently used hers in a very unexpected and helpful way. She was in the harbor of Tacoma, Washington, when the electric light plant of that city stopped working. The ship connected her machinery with the city's wires and for a whole month gave light and power to buildings and streets which otherwise would have been dark through thirty long winter nights. Without the help of the airplane carrier, much of the city's daytime work must have stopped for all that time.

The most powerful ships in our navy are our great

battleships, huge floating forts with heavy armor and big guns. None have been built for ten years past, and none will be built for years to come. Perhaps no more will ever be built, because all countries are trying to avoid wars in the future. There are treaties between fifteen of the great nations who have agreed never to attack one another. A battleship costs $20,000,000 or more to build. She carries over 1000 men, and their pay, with the yearly cost of repairing the ship, makes a battleship very expensive to run.

Our navy has many other kinds of ships. There are little gunboats for use on shallow rivers, and cruisers both large and small that can go anywhere on the sea. These are named for cities and towns all over our country, like Chicago, Detroit, Omaha, Cincinnati, Memphis, Trenton, and Marblehead. The handiest vessels of all are the swift destroyers, for their speed makes it possible for them to answer any hurry call for help more quickly than other ships can. They are low, narrow vessels, about ten times as long as they are broad. They have very powerful engines and can travel at a speed of over 34 knots. They are named for famous naval officers and sailors who have done brave deeds, like Decatur, Farragut, Macdonough, Paul Jones, Perry, and Reuben James.

Officers of the navy have done much to make the seas safe for ships. They have made maps of our

coasts that show all the hidden rocks and other dangers. They have also charted many of the currents in the ocean. Some have measured the Gulf Stream, and have told us what we know about the width, depth, and strength of this great river in the ocean. The Navy Department publishes the maps that the captains of ocean liners find so useful in guiding their ships across the ocean. Several naval officers have led exploring expeditions, like Admiral Peary who discovered the North Pole, Admiral Byrd who recently flew over the South Pole, and who has taught us so much about the whole Antarctic, and Commander MacMillan who has made many voyages into the Far North. Others helped to build the Panama Canal, and many have been called on to give advice in other great undertakings, where their experience and skill have been needed. Very often, after serving on naval vessels, these men go into our merchant marine, as our liners and cargo vessels are called. All the captains and most of the officers on the ships of the United States Lines have been trained in the navy.

The sailors in our navy are much like boys at school, because they are always being taught lessons that will make them useful citizens when they leave the navy. These young men learn about electricity, steam engines, and machinery, for example, and about radio

and airplanes. They are trained also in obedience and team work. They are splendid seamen. They are also brave men and proud to do their duty. They know what to do in any accident at sea, how to organize relief work, and how to give first aid to injured or drowning persons.

The Memphis is one of our light cruisers. She is the ship that brought Lindbergh home from France after his flight from New York to Paris. Other vessels of the same class are named Cincinnati, Concord, Marblehead, Milwaukee, Omaha, Raleigh, Richmond and Trenton.

The best way to learn more about the navy will be for you to visit a navy yard. If you can plan to do this on October 27th, the day called Navy Day,

you will find a great deal going on — many kinds of ships open to visitors, and drills, band concerts, and exhibitions. We hope that sometime you will have this opportunity.

BOOKS THAT YOU WILL ENJOY

"The Young Folks' Book of the Sea," by T. C. Bridges.

Chapter XXI, "The World's Lighthouses"; Chapter XXII, "Lightships, Buoys, and Beacons"; Chapter XXIII, "The Story of the Lifeboat."

"Lighthouses and Lightships," by F. A. Talbot.

"The Romance of Lighthouses and Lifeboats," by T. W. Corbin.

"The Boys' Book of Coast Guards," by I. Crump.

"Heroes of the Sea," by C. C. Fraser.

"Storm Fighters," by J. D. Whiting.

Each of these books has many illustrations.

"The United States Fleet," by F. A. Edwards.

A book of photographs with brief descriptions of all our naval vessels.

THE SECOND PART

SHIPS AND HOW THEY CAME TO BE

* * *

VIII. THE FIRST BOATS

From the Log to the Canoe

NOBODY knows who made the first boat, or where it was made, or what it was like. It was thousands of years ago, long before man began to keep records. Probably it was in the days of the cave men. Perhaps a cave man, more daring than the others, saw a log or the trunk of a fallen tree floating down a stream. He may have waded out from the shore, to try to spear the fish as they came swimming by. It may have seemed easier to do this if he sat on the log, so perhaps the idea came to him to climb up on it. It is likely that the first little voyage was made in this way. Or perhaps it was a boy, playing in the water, who first used a log to ride on. Sitting astride the log, and using his hands and feet as paddles, he may have found that he could easily and quickly cross the stream or pond.

The next step seems to have been to tie several logs together with strips of hide or with creeping vines. This made a raft, so that a whole family could go together. The father probably stood on the edge of the raft with a pole in his hand. He used the pole to push against the bank or the bottom of the stream. Later on, paddles were made, so that the mother and the

larger children could help to move the raft through the water.

The idea of making sails may have come when some one noticed that the log or raft moved faster when there was something for the wind to blow against. Perhaps some one hung a piece of an animal's hide on a small branch from a tree and held it up over his head as he rode on the raft.

The next step — and it was quite a long one — was to make a hollow boat. Where do you suppose this idea came from? Possibly even in those days boys made toy boats out of nut shells, just as you do out of English walnuts. Some father, watching his boy playing with these on a pool, may have thought of making a hollow boat. The first one was probably a log hollowed out by fire or by stone tools. This was not so heavy as a solid log, and there was less danger of falling overboard than there was from a raft. When a large log was made into a "dugout," as we call such boats, it could carry six or eight people. One or two people could do the paddling, because a dugout floated lightly on the water. As time went on, it was learned that dugouts were easier to paddle and to steer if their ends were pointed. So the later ones were shaped with pointed ends. Perhaps this idea came from the shape of a fish's head.

All of these very early boats were too heavy to be

carried from one lake to another, or past rocky places in a stream. When afloat, even the best of them were clumsy and hard to manage. So it was a happy day when some one had the idea of making boats so light that they could be carried on a man's back. The first ones of this sort were round wickerwork boats covered with hides. These are called "coracles," and must have looked like big clothes-baskets. You will be interested to know that even today boats very much like these are still used in certain parts of England when people want to paddle across a small river. They are common in Mesopotamia, on the Tigris River.

After the coracle the canoe was invented. First a man made a pointed framework of wooden ribs, and then he covered it with the skins of animals or the bark of trees. If you have ever heard a lecture by Commander Donald MacMillan, you probably remember what he says about the kayaks of the Eskimos in Greenland. These skin-covered boats are exactly like those made and used thousands of years ago. They are long and very sharp at the ends. In most stories about the North American Indians, canoes are mentioned. Longfellow's poem, *The Song of Hiawatha*, has a part named "Hiawatha's Sailing," which tells how a birch canoe was built. Our own canoes are made very much like those of the Indians.

In all parts of the world, boats were first made from whatever was right at hand. Bundles of reeds bound together were often used. Do you remember the story about the baby Moses and how he was found hidden among the bulrushes on the bank of a river in Egypt? These bulrushes were used by the ancient Egyptians to make boats. The same sort of reeds are used today along the Nile, and also on some of the lakes in Africa, in Korea, in Australia, and in Peru. Boats have been built in very much the same way in all these places. The earliest ones were simply rafts made by tying together large bundles of reeds. Gradually the natives learned to build up sides also, and to shape their rafts so that they could be paddled or sailed more easily. They made their sails from big square mats of the same kind of reeds that they used in making the boats themselves.

Vessels of the Egyptians

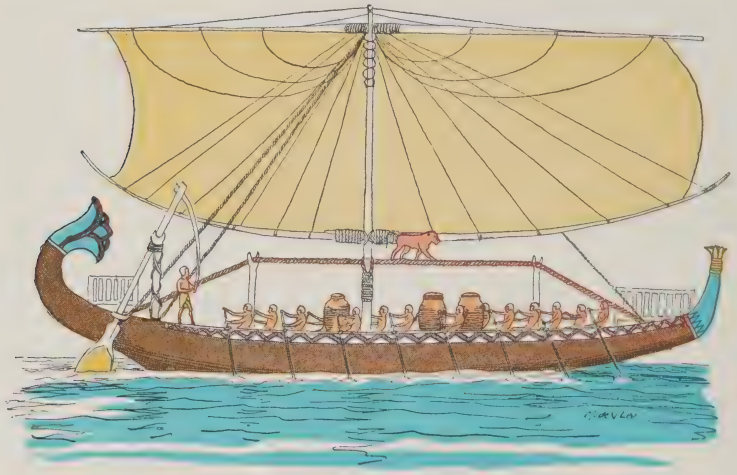
WE do not know how or when wood began to be used in the building of boats. It was probably in Egypt. When the Pyramids were built, it was necessary to carry the huge blocks of stone for great distances. They had to be carried by water, and boats stronger than those made of bulrushes were needed. When the Egyptians built boats from wood, they had to use short pieces because there were no

large trees in their country. Little models of these boats have been found. There is a drawing of one of them on the title page of this book.

Pictures of wooden ships used on the Nile have been found on the walls of the burial places of kings who lived as much as five thousand years ago. They would look strange to us because there was only one mast, usually shaped like the letter *A*, and because the ends of the ship were curved high above the water. Sometimes the bow was carved to look like a great flower, or like the head of a bird or beast. There was one large square sail which could be used only when the wind blew from straight behind. The rest of the time the ship was moved by oars. There were large numbers of slaves who worked the oars. They were chained to their seats, and if they did not row hard enough, they were sure to feel a blow from the slavemaster's whip, for he walked up and down the ship using the lash on any rowers whom he thought lazy. At the stern were two or more men who steered by means of paddles with wide blades, thrust down into the water on each side of the ship.

About thirty-five hundred years ago, the Egyptians began to use other ships on deep-sea voyages to foreign ports in the Mediterranean and down the coast of Africa. They probably always kept their ships within sight of land, because they did not dare to venture

out to sea. When they went on these voyages, the Egyptians said that they were going to the "land of Punt." For many years people tried to find out what country this meant, but they have decided that it was just a name for any place far distant from Egypt.



This is one of the Egyptian ships that made voyages to the "land of Punt." Compare this picture with the river boat shown on the title page of this book.

These ships carried Egyptian corn to the land of Punt, and brought back cargoes of wood, spices, gold, silver, ivory, furs, and slaves. The picture shows you how they looked. There was a heavy rope running between the bow and the stern which strengthened the ship. You see a monkey running along this rope. He was probably a pet or mascot of the crew,

such as sailors have today. The ladder-like things at the two ends are gangplanks, which were used when the ship was loading or unloading. At the stern you see one man with a huge steering-oar. Sometimes Egyptian ships had one of these on each side, and the men who worked them took turns in moving them so as to change the direction in which they wanted the ship to go.

A Phœnician bireme. Notice the eye painted on the prow. This is one of the things the Greeks copied from the Phœnicians.

Ships of the Phœnicians

THE first people who ventured to sail their ships far out on the ocean were the men of Phœnicia. This name means the land of palms, and it was given to a strip of land on the coast of what is now

Syria between Mount Lebanon and the Mediterranean Sea. Thus they were neighbors of the Egyptians. We call the people of this region Phœnicians. Their principal cities were Tyre and Sidon, built upon high cliffs, and it was believed that no enemies could ever capture them.

About three thousand years ago, the Phœnicians were the greatest traders in the world. They dealt in precious stones, gold, silver, ivory, glassware, cloth, dyes, and especially in robes colored a beautiful purple. In the sea near their own shores, they found immense quantities of little shellfish called murex, which they used to make a wonderful purple dye. Purple was a royal color which was worn only by kings, priests, and very rich people. The Phœnicians built up a great trade in the robes that they made from cloth of this color. Those who bought the robes paid well for them. The Phœnicians were anxious to find all the murex they could in order to make more dye than ever, so they sent their ships everywhere in search of it. The search led them far away from home, out through the Gates of Hercules, which was their name for the Straits of Gibraltar.

They were the first seamen who dared to sail by night. They learned how to steer by the North Star, and because they were the first people to do so, this star is sometimes called the Phœnician star. As they

sailed, they gained courage and went always farther. They may have sailed all the way around Africa, to India, and even to South America. Their trade grew and they set up trading posts in Greece, Cyprus, Crete, Spain, France, and England, and perhaps in other places. One of these posts in Africa, Carthage, grew into a great city, powerful enough to fight wars with Rome.

The Phœnicians were not only bolder sailors than the Egyptians, but also better shipbuilders. They improved seagoing ships by building them longer and broader. They also made them with high sterns, so that heavy waves could not dash over them. They used larger sails and improved the rigging. There were great forests in their land, full of cedar trees. Therefore the Phœnicians were able to make stronger ships because they had larger pieces of timber to use.

The Phœnicians were always ready to fight for the control of any country to which their ships went. They needed fighting ships also to protect the trading ships, and their precious cargoes. So they invented the "bireme," a vessel that had two rows of oars, one above the other. Later, the Phœnicians built still larger vessels, called "triremes," because they had three rows of oars. Because they had many more rowers, these vessels could go much faster than those with only a single row of oars. They had

masts and sails also, for use when the wind was favorable. Each fighting ship had rows of shields along its sides to protect her oarsmen, and at the bow it had a sharp ram for attacking enemy vessels.

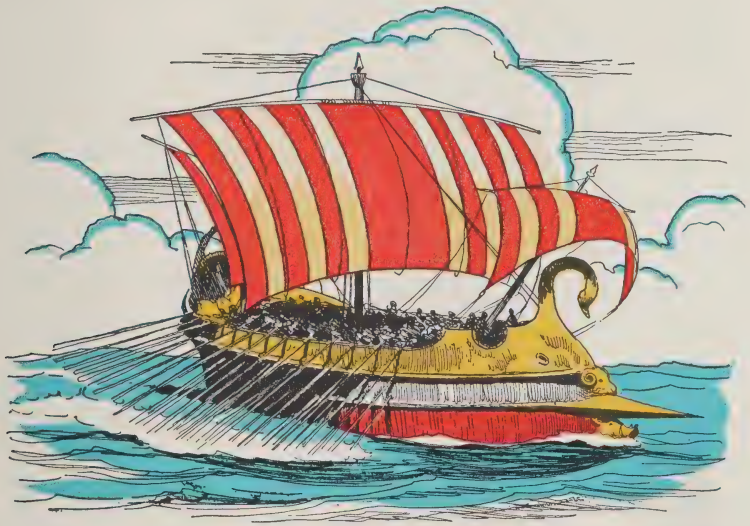
The Phœnicians used bright colors on their ships. If you should make a model of one of them, you could paint the hull either red or green with a yellow border along the upper edge. And you could stripe the sails with bands of green and purple running up and down.

Ships of the Greeks

THE Greeks, led by their king, Alexander the Great, conquered Phœnicia more than twenty-two hundred years ago. For many years they had been learning about trade and shipping by watching the Phœnicians. When war came between the two countries, the Greeks proved to be the better fighters. Afterwards they proved to be better merchants and better shipbuilders. In other books you can read of the great empire they set up, and how Alexander is said to have wept when he could find no more lands to conquer.

There was a great deal of difference between the ships the Greeks used in trade, and those they used in fighting. The merchant vessels were broad because their owners wished to carry big cargoes. They were slow because they were so broad, and because

their heavy loads made it hard to sail them. They had only a few rowers to help the ships move in light winds. The war vessels were narrow and swift and had large sails and many rowers.



A warship of the ancient Greeks.

The Greeks began where the Phœnicians left off. That is, instead of being satisfied with biremes and triremes, they built much larger ships, some of which had five or more rows of oars. They used many more slaves as rowers, and they sometimes put two or even three masts on their ships. So the Greek warships were very speedy. The slaves were chained to their benches, and as they rowed, they had to keep time to

the blows of a mallet with which an officer pounded upon a block of wood. When the officer wanted the ship to go faster, he beat faster, and the slaves strained at their oars as hard as they could. In the fighting ships, the sails and masts were taken down and sent ashore when a battle was expected.

Greek ships had colored sails, sometimes a plain color like blue, green, or purple, and sometimes striped with red and yellow bands. Their hulls were brightly colored, too. At first, the Greeks put a patch of red, purple, or blue at the bow and painted the rest of the ship black. Later they painted the whole of the ship one color, either purple, violet, yellow, blue, or white. Sometimes they added a border of another color, or else a design along the side of the ship. Green was a color which they never used unless they happened to be pirates. Can you tell why?

The Greeks tried to make their warships terrible to look at, hoping to frighten their enemies. They put two sharp rams at the bow, one just at the water's edge, and the other slightly above it. The upper one was often carved in the shape of a ram's head and was covered with bronze. The lower one might be shaped like a boar's head, and it might have a thick metal covering. You can imagine how these great beaks could damage an enemy ship when the Greeks sent theirs against its side with all the strength of hundreds

of rowers. Sometimes a Greek warship looked like an enormous dolphin. The rams made the dolphin's open mouth, and the stern was his tail raised high above the water. To make the ship look even more like a huge fish, the Greeks painted a big staring eye on each side of the bow. This must have made it appear quite like an angry living creature. To this day, the custom of painting eyes on the bows of vessels is followed in some parts of the world. Native tribes in some of the islands of the sea paint eyes on their war canoes, and the Chinese do so on their junks. Even peaceful fishing boats in Portugal and Italy are often decorated in this way.

In the first chapter of this book you read that we always speak of ships as if they were women. We wonder whether the Greeks started this custom. At any rate, each of their ships had its own name, which was usually that of a woman. In many cases the name of the builder of the ship was added. The Greeks were probably the first people in the world who thought it worth while to give each ship her own proper name.

Ships of the Romans

AFTER the Greeks came the Romans, who built up an even wider empire. They were a nation of soldiers who did not take naturally to the sea. The

earliest Roman ships were very small. There is a story that when they first tried to build a good-sized vessel, they had no idea how to do it. By and by they happened to find a great ship that had drifted ashore on the coast of Italy. This belonged to Carthage, an enemy of Rome, situated in North Africa.

A warship of the ancient Romans. Compare this picture with the Greek warship on page 133.

The Romans decided to copy this ship, which had five rows of oars. They hauled her up on the shore, measured her, and learned all they wanted to know about ships. While they were finishing the building of their own ship, they put up some rowers' benches on dry land and taught their slaves how to work the oars.

Only sixty days from the time the Romans began this work, they had built and manned a large fleet of big fighting ships. In later years they invented a number of things that made fighting ships more terrible than ever. For one thing, they added high towers on deck, to hold the soldiers. They did not do very much to improve merchant ships. Their ships were usually small, but now and then there was a very large one. Most of the Roman ships looked much like the galleys of the Greeks, having rows of oars and also sails. Their upper works were painted in bright colors and they often had gilded bows.

Viking Ships

ALL the ships that we have been reading about thus far sailed on or near the Mediterranean Sea. Now let us see what kinds of ships and sailors there were farther north. In what is now Norway, Sweden, and Denmark lived people whom we call Northmen, or Norsemen. They are also called Vikings, which means men of the creeks, because there are many small rivers or creeks in those lands. The Vikings often raided the homes of the people of England and carried away whatever they wanted. They were able to return home safely because no other people had ships as swift as theirs.

A thousand years ago, the Vikings were the most

fearless sailors in the world. They thought nothing of crossing the North Sea to England and France, even though their boats were small. They made voyages to Iceland and Greenland, where some of them made new homes, and to the place where Constantinople is now. One of their leaders, Leif Ericson, is believed to have sailed to America almost five hundred years before Columbus did. We know that it would have been possible for a ship of the Vikings to make that long voyage safely, because about forty years ago a boat built just like one of theirs did sail from Europe to America. She made the voyage almost as well as any modern sailing vessel of her size could have done, and proved herself not only a "good sea-boat," but a very fast sailer.

Perhaps you are wondering how we can be sure that this boat was an exact copy of a Viking ship. Well, it was the custom of the Vikings, when one of their chieftains died, to draw his ship ashore, place his body in the bow, and then bury ship and all under a great mound of earth. Some of these mounds have been opened. Inside have been found full-sized boats, not small models like those which the Egyptians placed in their burial places. Thus it has been possible to study Viking boats carefully, and to find out their size, how they were rigged, and other things about them.

The most complete Viking ship thus far found was unearthed at Gogstad, in Norway, about fifty years ago. She is 79 feet long and about 16 feet broad. The wood used was oak. The ship had a mast about 40 feet in height. This carried a big square sail, so wide that it extended beyond the two sides of the ship. Along each side were sixteen rowlocks, so we know that the ship was rowed by 32 men. To protect the oarsmen from spray and from the spears and arrows of enemies there were rows of strong wooden shields.

The commander stood on a raised platform at the stern and steered with a sort of rudder fastened to the side of the boat. Our name starboard for the right-hand side of a ship comes from the fact that the "steer-board" of the Vikings was on that side. You remember that the Egyptians used special oars for steering, and did not fasten them to the ship.

It took a great deal of courage to get into a small boat like this and sail across vast unknown seas, but that is what the Vikings did. Out upon the wide Atlantic they sailed, with neither compasses nor maps. Instead they steered by the sun and the north star, and when the weather was stormy and the sky overcast, it was hard to know where they were. It was then that the Vikings set free the land birds, called ravens, which they had taken with them on

the ship. If the ravens returned to the ship, the sailors knew that they were far from land. If the birds did not come back, the sailors steered in the direction that the ravens had taken, for they knew that land was near.

A Viking ship. Notice the ways in which this vessel is like the Phœnician ship, and the ways in which she is different.

If the Vikings found themselves near land at night, they took their ship as close to the shore as they could, dragged it up on the beach, made a fire, cooked their food, and spent the hours of darkness on dry land. If they were out at sea at nightfall, they took down their mast, laid it on two supports, one near each end of their ship, and spread the sail over it to

form a tent. Then the sailors crawled under it and went to sleep, each in a leather bag.

The Gogstad ship was one of what was known as "skuta," or the "swift shooting" sort. There were also larger Viking ships, called the "dragon" type. These were 130 feet long, and had 64 oars. They could carry 500 or 600 men, but only for short voyages because there was no way of making them at all comfortable. The sails of these ships were sometimes either white or white striped with red or blue. More often they were green, blue, or purple, especially if they were fighting ships. A sail that is about the same color as the water cannot be seen very far away, and of course this was an advantage when the Vikings were going on a raid. On the sail might be painted, in black, either a dragon, a raven, or an eagle. Both ends of the ship were pointed and rose high above the water. The bow was carved to look like a huge dragon's head, while the stern was like its tail. The sides were painted in stripes of bright colors, and so were the shields. The whole ship looked like a fierce dragon with great bright scales.

The Viking ships often had interesting names, such as Deer of the Surf, Raven of the Wind, Lion of the Waves, Serpent of the Sea. Most of their names show that the ships were swift ones. When the Vikings spoke of their sails, they sometimes called

them the cloak of the wind, or the cloth of the tree.

Among the poems about the Vikings that you should know are two by Kipling, "Song of the Red War-boat," and "The Pirates in England." There are also three by Longfellow, "The Building of the Long Serpent," "The Discoverer of the North Cape," and "The Skeleton in Armor."

To this day many of the fishing boats of Norway are built with hulls shaped very much like those of the old Norse ships. They are, of course, arranged to make the men comfortable on long voyages. But the shipbuilders of Norway have found it hard to shape the hulls in a way better suited to the stormy waters and high winds of the North.

BOOKS THAT YOU WILL ENJOY

"A Child's History of the World," by V. M. Hillyer.
"The Child's Story of the Human Race," by R. Coffman.
"How the Present Came from the Past," by M. E. Wells.
"Stories of the Vikings," by M. Dunlap.
"A History of Everyday Things in England, 1066–1499," by M. and C. H. B. Quennell.

Ships are pictured and described in each of the seven chapters making up the two Parts of this book.

IX. EARLY TRADERS

Venice and her Ships

THE voyages of the Vikings to America were soon forgotten because most people in those days were too busy taking care of their homes and themselves to pay much attention to stories about distant seas and lands. The next four hundred years, however, brought a great change. People began to think more about other parts of the world. They became especially interested in Asia. The reason was that the people of Europe had learned that they could get many of the comforts and luxuries of life from the countries of the Far East, like India, China, and Persia. Those lands produced spices, such as pepper, ginger, cloves, nutmegs, and cinnamon, which were much wanted in Europe for flavoring food and for preserving meats for eating during the long cold winters. Other things brought from the Far East were tea, sugar, perfumes, cottons, beautiful silks, rich carpets, jewels, gold, ivory, and ebony. Every one wished to have as many of these luxuries as he could afford. In exchange for these goods, the people of England, France, Germany, and Italy sent their own products, such as wool, leather, metal, and salt.

Now who carried the freight between Europe and Asia? If you will look at the map, you will see that Venice stands at a point quite easily reached from most other parts of Europe. You will see also that the Mediterranean Sea touches the shores of Asia.

From early times, there had been more or less trade between Europe and Asia. About two hundred years before the time of Columbus, this trade had become very large indeed. The Venetians had won the lion's share in the carrying of goods because they were better shipbuilders and better sailors than most of their rivals.

This picture gives you an idea of the way the Venetians decorated their ships.

Six times every year trading fleets, each made up of from three to six ships, sailed from Venice for different parts of the world. One fleet went to ports on the Black Sea; another to Greece and Constantinople; a third to Egypt, Barbary, and North Africa; a fourth

to Syrian ports; and the others to Portugal, France, England, and Holland. Single ships came and went all the time. In all, Venice had over three thousand trading vessels, large and small.

The six fleets must have been a beautiful sight. The ships were all painted white with bright red stripes. Each had a figurehead at the bow, and at her stern other carvings covered with gilt. The largest ships had more than one mast, sometimes two, sometimes three, and sometimes four. The sails were of different gay colors, and frequently were made of silk. They were used if the wind was fair. The emblem of Venice was a winged lion. This was often painted on the sail carried by the mast at the bow of a ship. When the sea was calm, the ships were rowed, and they had either one, two, or three rows of oars, depending upon their size.

Each ship was armed with cannon, and had at her bow a heavy beak for ramming pirate ships or other enemies. If fighting was necessary, every man on board, passengers as well as crew, was expected to do his part.

Oars were used in ships that sailed on the Mediterranean Sea long after they had been given up in more northerly countries, because in that sea the waters are usually smoother. Another reason was that the wealthy Venetian nobles were fond of show. A great

many oars in a ship meant that there were a great many slaves aboard to work them; and the more slaves a man had, the wealthier he must be.

The Venetians were very fond of pageants. There was one special ship that they used in a pageant once every year. She was named the Bucentaur, which means "the ship of gold." The first Bucentaur was built more than nine hundred years ago to celebrate a victory over the pirates of the Adriatic Sea. From that time for about eight hundred years there was always a ship bearing this name. As soon as one wore out, a new one was built, each larger and more beautiful than the earlier ones.

Each Bucentaur was adorned with crimson velvet, with cloth of gold, and with beautiful carvings and decorations. At the pageant, the ruler of the city, who was called the Doge, sailed out upon the Adriatic and dropped a golden ring into the water. With him went a great procession of gilded gondolas, bright with flags. This was called making Venice the bride of the sea. It showed their close union with the ocean, which the Venetians thought of as their safeguard, as well as the means of good fortune in the future.

Gondolas are boats much like very large canoes. Venice is a city built on a group of small islands. There are more canals than there are paved streets, so gondolas are used as we use automobiles and taxicabs.

Some Rivals of Venice

IN the days that we are telling you about there was no united country named Italy. Instead, many of the Italian cities, like Venice, Genoa, Pisa, and Florence, were independent republics. Each of these had many ships and controlled her own trade route. Florence stands at some distance from the sea on the same river on which Pisa stands. Pisa could, therefore, bar her way to the sea. Florence, however, got control of Leghorn, a seaport, and had fleets both of trading vessels and of war vessels.

Of all these cities, Genoa was the greatest rival of Venice. There were several wars between them. In one of their sea fights, a ship belonging to Genoa was commanded by a young man named Christopher Columbus. A few years later, he became the discoverer of America.

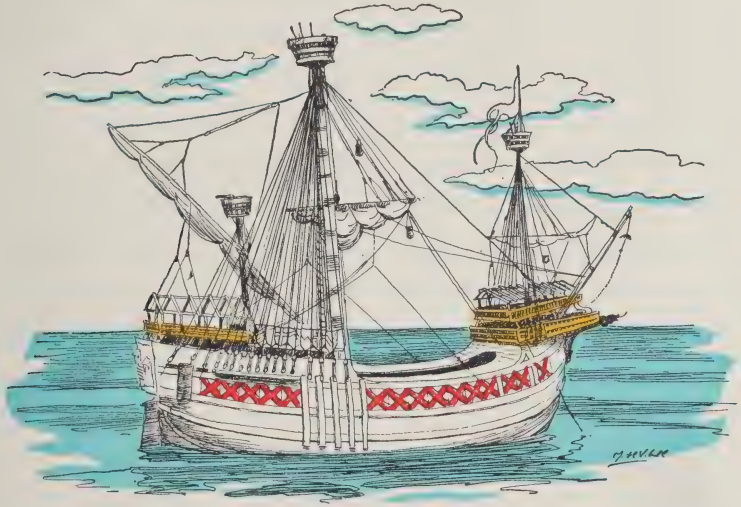
The struggle between Venice and Genoa led to improvements in the building of ships. When they were at war, each republic tried to build the best fighting ships. When they were at peace, each tried to build trading ships better for long voyages than the ships of their rivals. Ships that depended on oars were good for voyages on the calm blue waters of the Mediterranean; but they met trouble when they went into such stormy seas as those of the Bay of Biscay. Ships from Italy had to cross this part of the Atlantic

when on their way to some ports in Spain, and to France, England, or other northern parts of Europe.

In the course of time, the shipbuilders of Genoa learned how to build sailing vessels of a new kind. They were splendid big ships, large enough to carry heavy cargoes in times of peace, and strong enough to carry heavy cannon when they had to be used for fighting. These ships were called "carracks." You can see in the picture how they looked. Notice the high bow and the high stern, each of which contained several decks. The part at the bow came to be called the "forecastle," a word that shipbuilders use to this very day. It is the part of a ship where the sailors live. In our time several of the letters in this word are not pronounced at all. Sailors say "fōk'sl."

Carracks had one tall, heavy mainmast and two or more small masts. They were the first ships to have bowsprits. The foremast carried a small square sail. The huge mainmast carried a big square sail, with a tiny square one above it; and the little mast at the stern carried a sail shaped like a triangle. This last is called a lateen sail. It is still used on many vessel on the Mediterranean. It was like the sails used on both the mainmast and the mizzen mast of the Venetian vessels. Carracks were quite round both at the bow and at the stern and lay deep in the water. They were shaped very differently from the

galleys, the long narrow vessels that used oars. Also, their sides were higher than those of galleys. This made the carracks much better ships for use on the rough Atlantic. Do you understand why?



Carracks, more or less like this one, were built in many of the countries of Europe.

The carracks of Genoa must have been very gay to look at. They were decorated with gilded ornaments and carvings. Their sides were usually white, and sometimes were covered with bright crosses. Now and then a ship had black sides, on which were painted either red or white figures. A king of France thought the carracks such beautiful ships that he sent to Genoa and had one built.

About the time of Columbus, the power of Venice on the sea began to grow less. One reason was the discovery of a new route to the Far East — all the way by water. The map will show you that there were places where the goods from some parts of Asia had to be carried overland in order to reach the farthest ports to which the ships of Venice could go. Remember that in those days there was no Suez Canal, so the merchants from Persia, India, China, and the islands brought their goods in their own ships or by caravans as far as they could. The cargoes that came by sea were then unloaded and carried by caravans to the ports, where they were reloaded on the Venetian ships that were waiting. This was expensive.

Venice had defeated Genoa, but she was not able to defeat the Turks. The galleys of these people were now swarming over the eastern end of the Mediterranean, and before long their armies captured Constantinople. The Venetian traders were being driven out of Constantinople, and their ships and cargoes were often seized by the Turks. This was a great change. The Venetians had always used Constantinople as a trading center at which goods brought overland by caravans could be reloaded into ships. Before the Turks captured the city, Venetian traders had special rights there.

Voyages of the Portuguese

THE country that took the place of Venice as a country of shipbuilders and traders with the Far East was Portugal. For many years the people of Portugal, who are called Portuguese, had been making voyages down the coast of Africa. The compass had been introduced, so sailors dared to venture farther from the shore because they knew that they could find their way home. The Portuguese had learned a good deal from the seagoing ships of Genoa. They had invented ships something like the carracks, but much smaller. These were called "caravels." The ships of Columbus were caravels, and you will find a picture of one of them on page 157.

Year after year Portuguese caravels were sent south, and each time they sailed a little farther. People had always believed that beyond a certain point on the coast of Africa the water was boiling hot, and that if a sailor lived to come home, he would have been so burned that he would be black instead of white. At last a bold Venetian sailor who had been placed in command of some Portuguese caravels proved that neither of these beliefs was true. He sailed first to Madeira, then to the Canary Islands, then on to Cape Blanco, or the White Cape, and at last still farther south to the mouth of the river Senegal. Here the natives, who were Negroes, at

first thought that his ships were birds or else great fishes. They were also greatly surprised to see men with white skins, and tried to wash the white off. The Venetian captain continued his voyage past Cape Verde, or the Green Cape, which was the farthest point yet reached by a Portuguese vessel. He could not understand why the north star seemed to be lower and lower in the sky as he went farther south, because he did not know that the earth is round and that the position of the stars is changed as a ship moves over the curved surface of the earth. When he got home, he told about a new group of brilliant stars that he had seen in the southern sky, but which disappeared as he sailed back north. This is the group of stars that we call the Southern Cross, and it is as well known in the southern hemisphere as the Great Dipper is in the northern.

Some years later, a Portuguese sea captain sailed around the cape at the southern tip of Africa. He called this the Cape of Storms because of the bad weather he met there. But the King of Portugal gave it the name Cape of Good Hope, because he believed that if his sailors kept on trying, they would in the end succeed in making a voyage all the way to India.

This hope soon came true, for in the year 1497, Vasco da Gama led his fleet to Calicut. By this time Columbus had returned from his voyage to America.

Vasco da Gama knew this, and he was determined to succeed just as Columbus had succeeded. His ships met frightful storms at the Cape of Good Hope and were nearly wrecked; but Vasco da Gama told his men that they were going on, whatever happened. He worked as hard as any of the sailors, and at last, on the east coast of Africa, he sailed his fleet into calm seas. On Christmas Day, Vasco da Gama sighted land, to which he gave the name Natal, because it was first seen on the birthday or natal day of Our Lord. The voyagers pushed on, and at last, guided by a pilot given them by a friendly native chief in Mozambique, they found their way across the sea to India.

When they got back to Portugal, three years after setting out from that country, they brought the news that they had found the way to the Far East entirely by water. There was great rejoicing everywhere in Europe except in Genoa and Venice. There the merchants feared that trade with the Far East would now follow the new route, because it was both safer and cheaper.

BOOKS THAT YOU WILL ENJOY

"Man's Great Adventure," by S. Southwold.
Pages 121–27, "Rovers and Sea Wolves."

"Sea Wolves of Seven Shores," by J. P. Frothingham.

"Cities and Their Stories," by E. and R. Power.
Chapter I, "Athens"; Chapter II, "Rome"; Chapter IV, "Constantinople;" Chapter V, "Venice"; Chapter VII, "Amsterdam."

X. FINDING A NEW WORLD

The First Voyage of Columbus

THIS brings us to the story of Christopher Columbus, the man who discovered America. It is the story of a great sailor who refused to get discouraged. Columbus was born about 1451, the son of a weaver in Genoa. His father wished him to be a weaver, too; but Christopher loved the sea and ships and made up his mind that he would be a sailor. He was only fourteen when he first went to sea. He made many voyages through the Mediterranean, and learned that sea from end to end. He sailed to the coast of Guinea and to England, and he may have sailed to Iceland. Between his voyages he studied maps and the reports of sea captains. Columbus became sure that the earth is round, and that if a ship started sailing west from the coast of Europe, it would reach the lands of the Far East. He knew that the Portuguese were trying to sail eastward around Africa, but he believed that it would be shorter to sail westward across the Atlantic.

When Columbus was a young man of thirty-four, he went to the King of Portugal who had encouraged so many voyages. He hoped that the King would give him some ships for a voyage of his own. The King listened to all that Columbus had to say in proof of his ideas. He pretended not to be interested, but kept the maps that Columbus showed him, and gave them to one of his sea captains. Then he secretly

sent some ships to try out Columbus's ideas. These ships were caught in a storm and turned back in fear.

People in those days were afraid of the sea. They believed that the earth was flat like a table, and that if ships sailed too far, they would fall off the edge. They believed that the Atlantic was a great "sea of darkness," covered with thick black fog. They believed that the waves were as high as mountains, and that the water was full of horrible great fish and serpents. There were stories of huge sea birds, strong enough to carry off a ship. Worst of all, there was the belief that a great monster lived at the bottom of the ocean, and that he would thrust up his great hands, like rocky cliffs, and drag a ship down under the waves. So we can hardly wonder that the Portuguese sailors were timid.

Columbus was so angry over the dishonest trick of the King that he left Portugal and returned to Genoa. He tried to interest the merchants there, but failed, because they still hoped to keep their old route through the Mediterranean. Then Columbus went to Venice, where he found the same feeling. You would suppose that he would have been discouraged; but he was so sure that his ideas were right that he kept on trying to find some one who would help him to prove them. So he went to Spain to talk with Ferdinand and Isabella, the King and Queen. They

put him off, so Columbus started for France. At the same time he sent his brother Bartholomew to England. Probably Bartholomew might have got help from England, because the English King had already sent explorers out upon the Atlantic and was truly interested to learn what lands lay beyond that ocean. As bad luck would have it, Bartholomew fell into the hands of pirates and was delayed in getting to London. But good luck came, too.

Before either the King of England or the King of France gave him an answer, Christopher was called back by the Queen of Spain. He found his patience was at last rewarded, for the Spanish rulers, chiefly through Isabella's interest, had decided to give him some ships for his voyage.

They fitted out three small ships. It was hard to find sailors who dared go on the voyage. Only ninety in all were needed, but to get even those few it was necessary to set free from jail a number of men who were willing to put to sea with Columbus.

The largest of his ships Columbus named Santa Maria. This was in honor of the monastery called Santa Maria de Rabida, whose monks had been kind to Columbus during his long days of waiting. The Santa Maria was about ninety feet long and twenty feet wide, or about the size of a modern towboat. Even with her bowsprit, she was not as long as the

Leviathan is wide. She had three masts, on two of which were square sails, with a lateen sail on the mizzen-mast. On each of the square sails a large cross was painted, in bright red. At the head of the mainmast flew the royal banner of Ferdinand and Isabella. The Santa Maria was the only one of the three vessels that was decked over her entire length. Her bow and her stern rose high above the water, and there were cabins at each end. She carried fifty-two men, but we can only guess how so many could stow themselves away in so small a ship. Most of the crew had to sleep on deck, because the cabins were filled with supplies. They cooked their food on deck in a stove made out of a box of small stones.

The Santa Maria, the flagship of Columbus.

Four hundred years after the first voyage of Columbus, there was a World's Fair in Chicago. As part of Spain's exhibition a ship as nearly as possible like the Santa Maria was built. She sailed across the Atlantic and proved slow and hard to steer. She pitched terribly and her crew were thoroughly uncomfortable.

The second vessel in the fleet of Columbus was a smaller caravel named Pinta, which means the painted lady. She had three masts, one with a square sail and two with lateen sails. Lateen sails, like our fore-and-aft rig, help a vessel to sail almost directly against the wind. The Pinta was the best sailer of the three. In her crew were twenty men. The third caravel was the smallest of all, and her name, Niña, means the baby. She had two masts, each lateen-rigged. She carried eighteen men. The Pinta was decked only at bow and stern, while the Niña was wholly open to the weather. Most of the sailors on these two caravels were not able to cover themselves at night even as much as the old Vikings used to do with a tent made out of a sail.

The ships sailed from Palos, in Spain, at sunrise on Friday, August 3, 1492. The story of the great voyage is told in so many other books that we shall not tell it here. The important thing to remember is that Columbus kept sailing on and on, in spite of the fears of his sailors who constantly expected

that something terrible would happen. Two poems named "Columbus," one by A. H. Clough and the other by Joaquin Miller, will give you a good idea of the great discoverer's heroism. Finally, on October 12, 1492, the courage of Columbus was rewarded, and the little fleet came safely to land. After offering thanks to God and naming the island San Salvador, Columbus planted banners bearing the initials of Ferdinand and Isabella, and claimed the land for Spain.

As we know, Columbus discovered one of the group of islands that we call the West Indies. He believed that he had reached some island in the Far East, just as he had set out to do. To the end of his days he believed this; and all the people of his time did, too.

The Discovery of the Pacific Ocean.

COLUMBUS made in all four voyages to America. After him came many other explorers, most of whom went to the mainland in search of gold. They had heard that the natives had great quantities of this precious metal. One of these explorers was a Spaniard named Balboa. He set out to get as much gold as he could. He believed in making friends with the Indians, but he was ready to conquer those who started to fight him.

One of the Indian chiefs on the Isthmus of Panama

saw some of Balboa's men disputing over the division of a little gold. "Why do you quarrel over such a trifle?" he asked. "If gold is so valuable in your eyes that you leave your homes and expose yourselves to suffering and danger in trying to get it, I will tell you of a place where you can all get as much as any of you can possibly wish. Beyond those high mountains lies a mighty ocean, which you can see from the mountain-top. Sail to the south. There is so much gold there that the people eat and drink out of golden dishes."

Balboa chose about two hundred of his boldest men and started to find this rich country. For thirty days, wearing heavy armor, they struggled through dense jungles where it was so hot that even the thinnest clothes would have been a burden. They had to hack out a pathway and to fight their way against hostile Indians; but at last they came into the open on a mountain-side above the level of the trees. Balboa went ahead by himself and climbed the summit. Far away to the south, he saw a great expanse of water glittering in the sun. No white man had ever laid eyes on it before. This was the ocean to which, a few years later, the explorer Magellan gave the name Pacific.

Balboa called his followers, and bade them set up a wooden cross and a mound of stones. He then

claimed the land for the King of Spain. It took five days more to make his way down to the shores of the ocean. There Balboa, carrying a banner, waded into the water. In the name of his king, he took possession, not only of the newly discovered ocean, but also of all the islands within it and of all the lands whose shores it washed. This was in 1513.

Balboa explored some near-by islands, but he had only two frail canoes belonging to the natives. These were not suitable to use far out on the ocean. Evidently ships were needed, so Balboa went back across the isthmus to a Spanish settlement, and asked for help in pushing on to the southern lands that were said to be so wonderfully rich in gold.

Nearly five years passed before an expedition could be made ready. For one thing, there was no way of building ships on the shores of the South Sea, as the Spaniards called the new ocean. It was therefore necessary to build the ships for Balboa on the shore of the Caribbean Sea. Then the ships had to be taken apart, and carried piece by piece through the jungle and up over the mountains until they could be put together again and launched in the waters on the other side of the isthmus. This was a very hard thing to do, but Balboa and his men, with the help of friendly Indians, set about it with the highest courage.

Finally two ships were built and carried across the

isthmus just as planned. They were launched on a river that flowed into the South Sea. As they sailed toward the ocean, the men sometimes had to dig a channel for the ships, because the river was too shallow to float them. When the ships reached the ocean, it was found that the timber of which they had been built was badly eaten by worms. The ships were not seaworthy. They were barely able to reach an island not far from the shore. Balboa's courage, however, was still as good as ever. He set to work to rebuild the two ships that he had, and even to build two larger ones.

Sad to say, Balboa never made the voyage to those "golden kingdoms" that his Indian friends had told him about. The governor of the Spanish colony on the isthmus was not friendly. Before Balboa's ships could be finished, the governor put a stop to the whole undertaking. Even though Balboa never sailed a ship far into the Pacific, he won fame enough for any man through his discovery of that mighty ocean.

The First Voyage Around the World

FOR several years after the voyage of Columbus, people believed that the islands that he had found lay close to the shores of Asia. They believed also that the mainland of America was a part of Asia. By and by it became clear that neither of these ideas

was true. Then sailors began to try to find a way either through or around the lands of the New World, so that they could go on to the lands of the Far East which they already knew. The Portuguese had found a way by sailing eastward around Africa, so the Spaniards tried to find a way by sailing westward.

Balboa's discovery proved that there was a great ocean beyond America. When the news came to Ferdinand Magellan, a skillful Portuguese sailor, he made up his mind that he would sail across it. He was sure that he could find his way to the Far East and India, and that he could come home by Vasco da Gama's route along the coast of Africa.

Magellan went to the King of Spain and told his plans. The King was interested and helped Magellan to get five ships. The largest was a little more than twice as big as the Pinta, which you remember was one of the ships in the fleet of Columbus, and the smallest was nearly as big as the Santa Maria. We do not know how many masts these ships had, or what their sails were like, but probably they were not very different from those of the ships of Columbus. Each of Magellan's ships, however, had high castles at bow and stern, and each was decked all over. They were all very old and patched. A man who saw them said, "I should be sorry to sail even as far as the Canary

Islands in them, for their timbers are as soft as butter."

It was hard to get crews for the ships. Sailors seemed to think that this voyage would be about as full of peril and about as long as a voyage to the moon, and they dared not go. Finally, Magellan got the number of men he needed, about 280 in all. They were natives of many different lands — Spain, Portugal, Genoa, Sicily, Holland, France, Germany and England. As the voyage went on, Magellan found it hard to manage such a mixed lot of sailors.

When everything was ready, Magellan went aboard the Trinidad, which he had chosen as his flagship. On September 20, 1519, the fleet left the port of Seville and started on the first voyage ever made all the way around the world. It took more than two months to cross the Atlantic. Off the Canary Islands the ships were becalmed for about three weeks. Farther on, they met such storms of wind and rain that they had to lower their sails and let the sea drive them along. The ships rolled so that now and then their yards dipped into the waves. Nobody on board expected to escape shipwreck. Food and water grew scarce, and the sailors became disobedient. Magellan believed that he could take his ships through any difficulty. His orders to his captains were, "Follow the flagship and ask no questions." The other ships

were able to see where the flagship was, even on the darkest night, because the Trinidad carried at her stern a big blazing torch.

At last the fleet safely reached the coast of Brazil, near Pernambuco. The natives were eager to trade, so Magellan's men were able to get plenty of fresh provisions. The sailors learned here about the nets of cotton, called "hamaks," in which the natives slept on hot nights. Thus the hammocks used even today on warships date from this great voyage of Magellan.

Soon the ships started out again. They followed the coast southward and came to what Magellan thought must be the opening of a strait. He sailed into it, hoping that it led into the Pacific Ocean; but it turned out to be the mouth of the great river that we know as La Plata. The voyage was continued southward, while storm after storm battered the frail ships. The sailors again lost faith in their leader and refused to obey his orders. Magellan punished them severely and pushed on, still hunting for an opening through which he could sail westward. The coast was dangerous and there were many storms. One ship was wrecked, but her crew were saved, all but one man.

Thirteen months after starting from Seville, Magellan found the strait to which his name has been given.

It was a narrow, winding, dangerous passage. Snow-clad mountains rose on both sides, some of them seven thousand feet high. At night strange fires blazed on the sides of the mountains to the south where savages lived. Magellan called this country Tierra del Fuego, which means the land of fire. The water was rough, and it took more than five weeks to sail four hundred miles. Part-way through this strait, one of the ships stole away one night and turned back toward Spain. Sailors on the other ships begged to return home, too. "If I have to eat the leather off the ships' yards," replied Magellan firmly, "yet will I go on and do my work." Like Columbus, he refused to be discouraged.

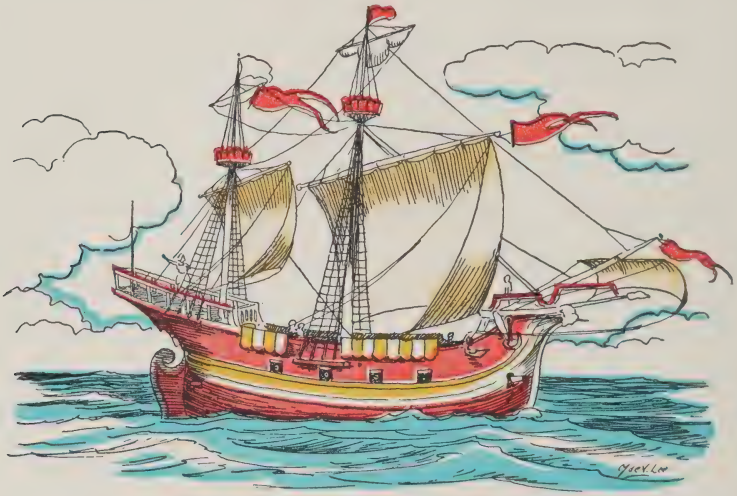
At last the three remaining ships fought their way to the open ocean — the South Sea that Balboa had discovered. Its calm blue waters seemed so pleasant after the stormy strait that Magellan named this ocean the Pacific. It was well that the skies were clear and the wind favorable, because ninety-eight days passed before land was again sighted. All their drinking-water was gone and all their food had been eaten. The men actually had to gnaw strips of leather taken from the rigging. If they had stayed much longer at sea, all must have died.

At last they came to a little group of islands where the people were savages of the lowest sort. They

stole so many things from Magellan's ships that he called these islands the Ladrones, from the Spanish word meaning thieves. Here, however, the suffering sailors at least got fresh food and water. From the Ladrone Islands, Magellan sailed to another group which later came to be named the Philippines, in honor of a man named Philip who at that time had become the King of Spain. Fighting with the natives took place and Magellan was killed. More misfortune came when the Spaniards lost another ship. She had grown so leaky that she was not safe. She was therefore set on fire and burned to the water's edge.

By this time there were only 115 men out of the number who had started on the voyage. They crowded into the two ships that were left, the Trinidad and the Vittoria, and started on the homeward voyage. Early in November, 1521, they reached the Spice Islands, the goal at which they had been aiming. Here they took on board a great quantity of cloves and other spices, and spent several months quite pleasantly. Then they set sail for Spain, following the route first taken by Vasco da Gama some years before. Presently they met a small fleet of Portuguese vessels. The Portuguese were deadly rivals of the Spaniards for the trade of this part of the world. They seized the Trinidad, her cargo, and her men, saying that a Spanish fleet had no right to trade in these islands.

One day in September, 1522, a single shabby, patched vessel with ragged sails, rusty ironwork, and sides bare of paint, sailed slowly into the harbor of



Magellan's ship, the Vittoria, as shown in drawings made more than four hundred years ago.

Seville, Spain, and dropped her anchor. She was the Vittoria, the first ship to sail around the world; and she brought home only eighteen men. But the voyage proved that Columbus and Magellan had been right about the shape of the earth, and that ships could sail to the east by starting to sail west. It proved also that America was separated from Asia by a great ocean, and that the world was much larger than people had believed.

At the back of this book you will find a map which shows the routes of the voyagers whose stories are told in this chapter.

BOOKS THAT YOU WILL ENJOY

"Man's Great Adventure," by S. Southwold.

Pages 217–26, "The Age of Discovery."

"Finding America," by O. E. Smallidge and F. L. Paxson.

"A Book of Discovery," by M. B. Synge.

The stories of the world's exploration from the earliest times to the finding of the South Pole. With many illustrations of which nine are in colors.

"The Young Folks' Book of Discovery," by T. C. Bridges.

XI. FAMOUS SHIPS AND SAILORS

Drake's Great Voyage

AFTER Magellan's voyage, more than fifty years passed before another ship sailed around the world. This time the commander was an Englishman, Francis Drake. He had already made voyages to America, and had seen the Pacific Ocean from nearly the same spot that Balboa had his first view of it. Then it was that Drake made a vow sometime to sail a ship on those waters.

In 1577, Drake started out from England with five ships, and nearly three years later he returned with only one. Three ships were lost on the voyage, and the fourth deserted. This was the same experience that Magellan had had. About one hundred and fifty men sailed with Drake, of whom only fifty or so got home alive.

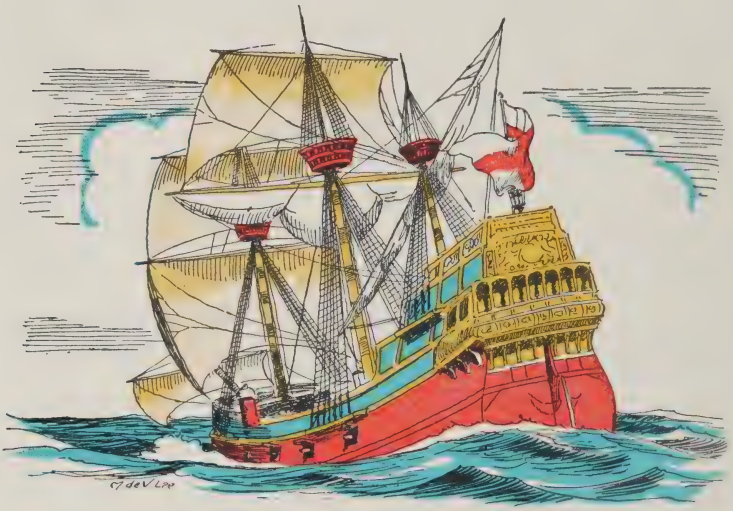
The ships that made up Drake's fleet when he sailed from England were better vessels and more completely armed and equipped than any that had ever before left the country, either for trade or exploration. The flagship, the Pelican, was most splendidly fitted out. She had fine oak furniture and dishes of pure silver. Drake took violinists and a drummer to make music at meal time. Like each of the other ships, the Pelican carried supplies for a year or so, articles for trading, and a good-sized boat stowed away in sections ready to be put together when needed.

The fleet first coasted along Africa as far as Cape Verde, and then crossed the Atlantic to Brazil, taking fifty-four days. Thence it followed Magellan's track southward, to the Strait of Magellan. Here Drake gave to his flagship the new name, Golden Hind, because he wished to honor an English nobleman who was paying part of the costs of the voyage. Drake chose this name because his friend had a coat of arms on which was a golden hind or stag.

The passage through the strait was made in sixteen days, without as much difficulty as Magellan had met. This is almost as good speed as the square-riggers of two hundred years later usually made. It shows that Drake was a skillful sailor. But when the ships entered the Pacific, they ran into rough waters. For fifty-three days they struggled against storms and were driven about like pieces of driftwood. This was another experience just the opposite of Magellan's. One of his ships disappeared, and Drake would have lost the Golden Hind, too, if she had not been so strongly built. At last good weather came.

All along the shore of South America, Drake sailed, raiding towns and capturing many Spanish treasure-ships bound from Peru to Panama. One of these ships named Our Lady of the Conception, the Spaniards had nicknamed Spitfire because they thought her a good fighter. She carried so rich a cargo that

when the English captured her, they changed this nickname to Spitsilver. It took Drake three days to put all her treasure of silver, gold, and precious stones aboard the Golden Hind. Then he sailed northward.



Drake's ship the Pelican, later named the Golden Hind.

He coasted along California and Oregon, where the Indians wished to make him their king. He claimed this country for Queen Elizabeth by nailing a silver sixpence upon a strong post set in the ground. When he got almost to Vancouver Island, he turned westward across the Pacific. He sailed from one group of islands to another, finally reaching the Philippines and the Spice Islands, where he took on provisions

and as much cargo of spices and sugar as he could carry.

Once the Golden Hind barely escaped shipwreck. She was so heavily laden with treasure that she grounded on a reef, where she stuck fast for twenty hours. The only way to save the ship was to make her lighter, so the sailors threw overboard a large part of their spices and some of their cannon and supplies. Finally, with the help of wind and tide, the Golden Hind slid off the reef into deep water. She was fortunately not very much damaged because the timbers of her hull were double the usual thickness.

Drake pushed on, rounded the Cape of Good Hope, and set his course for England. When he got home, Queen Elizabeth made him a knight as a reward for the harm he had done her enemies, the Spanish. The treasure that he had taken from them was worth more than $5,500,000 in our money. Drake was now Sir Francis and had a coat of arms of his own. His gallant little ship, the Golden Hind, was kept as a memorial of the first English voyage around the world, but after a hundred years her timbers were so decayed that she could not be repaired. She had to be taken to pieces. From some of her planks a famous big chair was made, which you may still see at the University of Oxford in England.

Drake's voyage was important because it proved

that English ships were more than a match for the ships of Spain. Ever since Balboa's discovery, Spain had tried to keep the ships of other countries from sailing on the Pacific. The English, however, now knew that they could, without fear, sail their ships there or anywhere else in the world that they wished.

Drake was the greatest of Queen Elizabeth's seamen. You should read, sometime, not only the full story of this voyage of his around the world, but also about his part in the fight against the Spanish Armada and his many other adventures. Newbolt has a poem, "Drake's Drum," that is well worth learning by heart, and Kipling has two, "With Drake in the Tropics" and "Frankie's Trade."

Why the English Ships Defeated the Spanish

AFTER Balboa's discovery of the Pacific Ocean, many explorers went to America. Some of them sailed southward in the new ocean, hoping to reach the lands of gold of which Balboa had heard. Before many years, they conquered Peru, where they found the great stores of gold, silver, and precious stones that they had been seeking. Deeply laden treasure-ships from Peru sailed up the west coast of South America to Panama, where a busy little city was growing up. Here the ships were unloaded, and their cargoes were put on the backs of mules and car-

ried across the isthmus to Porto Bello, which stood about twenty miles from the present city of Colon. The mule trains traveled over a road cut through the tangled wilderness not far from the place where the Panama Canal is now.

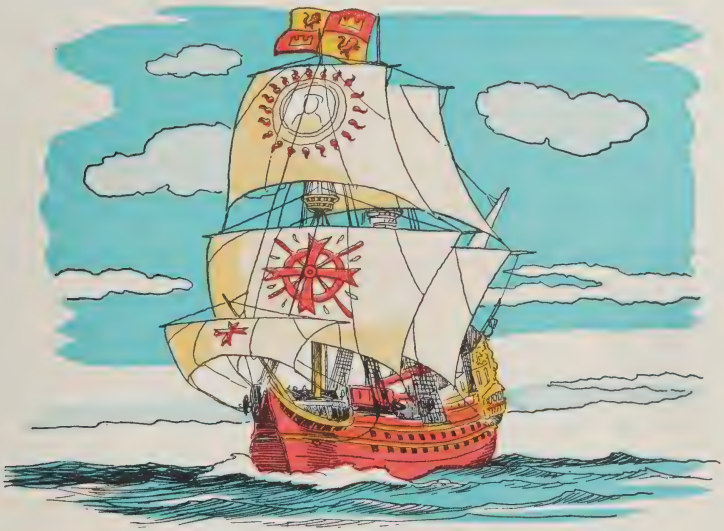
At Porto Bello other treasure-ships were loaded and started back home to Spain. Usually several of them sailed together in a fleet. To guard against enemies, who were always watching for a chance to attack these ships and take their rich cargoes, a heavily armed fighting ship sailed with them. There was little difference between the two kinds of ships, except that the fighting ships carried more cannon. Both were called "galleons." They were very strongly built with thick sides, and they had high bows and sterns on which they carried cannon. They had blunt rounded bows, and this made them slow sailers.

The oceans near America were full of ships belonging to the enemies of Spain — England, France, and Holland. The English ships were built in much the same way that the Spanish ships were, but they were smaller and swifter. Their bows and sterns were more nearly on the same level with their main deck, and they carried cannon, not only at their two ends, but also along each side. Thus they could fire what is called a broadside; that is, many cannon could be

fired from one side or the other at the same time. Nearly always a number of these ships cruised together. When they met a Spanish fleet, all the little English vessels would single out some big galleon and surround her. Then they would try to shoot her to pieces with broadsides from their cannon. Closer and closer they would go until they got right beside the Spanish galleon. Then the English sailors would fight their way aboard the enemy, climbing up between the two castles where the sides were lower. After this it was not hard to drive the Spaniards, first out of one end of their ship, and then out of the other. In this way the English ships would capture one after another of the Spanish treasure-ships in a fleet. The other enemies of the Spaniards used the same kinds of ships and the same way of fighting that the English did. The result was that Spain lost many ships and a great deal of treasure.

About a hundred years after the first voyage of Columbus, Spain tried to invade and conquer England, her chief enemy, so that no more English ships could put to sea and capture Spanish gold. The Invincible Armada was the largest fleet of great galleons and other ships that the world had ever seen. But when it was attacked by the swarms of little English ships, it was entirely defeated. One reason was that the Spanish ships were too big and clumsy to

fight ships that lay closer to the water. When the Spanish cannon were fired, many of their balls passed over the English ships. The English, on the other hand, could pour their broadsides straight into the huge galleons. Another reason for the defeat of the Armada was a great storm which drove many of the ships ashore and wrecked them. Read Macaulay's fine poem named "The Armada."



One of the galleons in the Invincible Armada of Spain.

One of the famous English ships in the fight with the Invincible Armada was named the Revenge. She was commanded by Sir Francis Drake. A few years later, she fought some other Spanish galleons all

by herself. There were fifty-three of them, but the brave little Revenge was captured only after she had sunk four of these enemies. You will enjoy reading a poem by Lord Tennyson, "The Revenge: A Ballad of the Fleet," which tells the story of this last fight of the Revenge.

Green and white were the colors of the English royal family, so the Revenge was painted with a band of these colors on the forecastle and along her sides. Below this band her sides were brown, and under the water line she was painted white.

Other English ships of this time were painted in other colors, unless they belonged to the Queen. Sometimes their hulls were green, and sometimes red. They often had a band of blue, and along their quarter-decks were gilded wreaths and other ornaments. You will often see models of the ships of Queen Elizabeth's day, and their coloring is one of the most interesting things about them.

The English East Indiamen

YOU remember that Vasco da Gama discovered the route from Europe to the Far East by way of the Cape of Good Hope. Before many years had passed, the ships of Portugal, just as the Venetians had feared, got control of the carrying trade between the Far East and Europe. Later, Portugal lost con-

trol of the trade routes, and great companies for trading with the Far East were formed in England, in Holland, and in other countries. This was about 1600.

The first ships built by the English East India Company were much like the Portuguese carracks. They were such great lumbering vessels that people called them wagons. One named the Trades Increase was the largest trading vessel ever built up to that time. She was lost on her first voyage, and after that the company built ships only about half as big.

The idea was to shape these ships so that they could carry as much cargo as possible and to arm them for fighting. Not much attention was paid to making them good sailers. Their sides were high above the water and they had lofty castles at bow and stern. Their sides bristled with cannon, because the seas where they sailed were full of pirates, and the East-Indiamen often had to beat off their attacks. Also, in time of war, these ships must be able to hold their own against the armed ships of the French or the Dutch.

A hundred years or so later, the East India Company began to build ships of a different sort. These had three tall masts, all square-rigged. They had bows as round as an apple, and they bulged out along

the water-line. They were strong and heavy, built to butt their way through the sea instead of cutting through as later ships did. Both their ends were decorated with a lot of heavy woodwork, carved and gilded. At the stern was a gallery full of windows. They were short, broad vessels, and sailors who made voyages in them said that they often rolled in a heavy sea until the yards touched the water.

An English East Indiaman.

These ships were solidly built of teakwood, which never rots in water. An East Indiaman once struck on a reef near Gibraltar. She got off with a good deal of difficulty and sailed back to England. When she was put into the dry-dock for repairs the workmen

found a big piece of rock wedged into a hole near her keel. If this had fallen out while the ship was at sea, she would probably have filled with water and gone down. Another of these tough old ships sailed to the United States when she was over a hundred years old. She had new sails, of course, but her hull and her masts were the original ones. It took her sixty-six days to cross the Atlantic, which gives you an idea of the slow sailing of the East Indiamen. They were not built to make fast voyages, and no effort was made to hurry them. Their captains always took in sail at night. No matter how fine the weather might be, or how favorable the wind, many of the sails were furled and the ship just loafed along until daylight came and the sails were set again. It is no wonder that these ships took a long time on their voyages.

About a hundred years ago, the laws of England were changed, so that private ships were allowed to trade with India and China. Up to that time only ships of the East India Company could do so. The stately old East Indiamen disappeared from the sea, and very shortly their place was taken by swift, trim-looking ships, some of which belonged to American merchants. As the years passed, American ships came to be known in all the ports of the world. We shall tell you about these in another chapter.

The Pirates

PIRATES were the enemies of the ships of all countries. They were sea robbers who cruised about in swift little vessels and attacked any trading ships that they thought carried valuable cargoes. Probably the earliest pirates in the history of the world were those who attacked the ships of the Phœnicians, the Greeks, and the Romans as they sailed through the Mediterranean Sea. In later times, pirates robbed the Venetian ships and those of the different East India Companies. In the harbors and bays of that sea until about one hundred and twenty-five years ago there were still pirate vessels lying in wait to pounce upon the ships of all countries.

Many of these pirates lived in the lands called the Barbary States — Tripoli, Morocco, Algiers, and Tunis, which lie along the northern shores of Africa. Their ships were long and narrow. They had from one to three lateen sails, but often used oars also. The oarsmen were sailors and passengers who had been captured from the ships attacked by the pirates. They were treated as slaves. Their lives were very hard, for they often had to row as much as ten hours at a time without resting. They were chained to the benches, just as the slaves of the Romans had been. Cruel masters stood over them with whips in their hands to see that they kept at work. There was no

possible escape for the rowers unless the pirate vessels were captured. If the ships were sunk, these poor men were likely to be drowned.

The Barbary pirate ships sometimes flew the flag of some European country, so that they would be thought to be peaceable vessels. This made it possible for them to get close to their victims before they were seen to be pirates. Then they would swarm on board and overpower the crew in hand-to-hand fighting. Sometimes, of course, the pirates could not get alongside before the trading ship saw what they were. Then there was a fight at longer range, in which cannon were used.

There were pirates, not only in the Mediterranean, but around the shores of India and the near-by islands. There were also pirates in the West Indies, usually either English or French, and sometimes Dutch. Many of these men had started in by capturing only the Spanish treasure-ships, laden with gold and silver from America. They took their booty back to their own country, where it was shared by the owners of the ships that captured it. As time went on, the pirates fell into the way of attacking any vessel that seemed likely to have a rich cargo. It did not matter to them if the ship belonged to their own country. They had learned how easy it was for a number of swift boats full of desperate men to over-

power a much larger vessel. They saw no reason why, if they captured such a ship, they should not keep its treasure for themselves. So they made strongholds in some of the islands of the West Indies, and set out to make their fortunes as sea robbers. There are

A pirate ship chasing a merchantman.

many thrilling stories of the part our navy took in putting an end, first to the pirates of the Barbary States, and later, in wiping out those nearer home, in the West Indies.

A good many pirates were known by their nicknames, such as Red Legs, Blackbeard, Long Ben, and Calico Jack. There was a famous pirate named Captain Kidd, and another one named Captain Shiv-

ers. You will find stories about these pirates and others in Stevenson's *Treasure Island*, in Frothingham's *Sea Wolves of Seven Shores*, Stockton's *Buccaneers and Pirates of our Coast*, or Pyle's *Book of Pirates*. Among the best poems about pirates is Masefield's "A Ballad of John Silver."

Pirate ships often had such names as Black Joke, Flying Dragon, Indian Queen, or Good Fortune. They often flew a special flag known as the Jolly Roger, made up to suit each pirate captain's ideas. If it showed a skull and cross bones, or a skeleton, it meant that ships the pirates attacked could expect no mercy.

BOOKS THAT YOU WILL ENJOY

"Boys' Book of Sea Fights," by C. C. Fraser.

"Sea Fighters from Drake to Farragut," by J. P. Frothingham.

"The Days of Elizabeth," by J. A. Brendon.

Chapter XI, "Naval Occasions"; Chapter XII, "The Sea-Dogs of Devon."

"Art for Children," by A. M. Berry.

This has a chapter entitled "The Book of Ships," pages 63–82, which contains many pictures by great artists, some in colors.

XII. SHIPS ALL AMERICANS SHOULD KNOW

Henry Hudson and the Half Moon

JUST a few years before the Mayflower's voyage, Henry Hudson crossed the Atlantic several times in tiny vessels. He was an English sailor who was first sent out by the Dutch East India Company to try to sail across the North Pole and then on to the Spice Islands in the Far East. The Dutch had by this time taken the place of the Portuguese as the leading traders in that part of the world, and they wanted to find a new way of reaching it. This attempt is interesting, because it was three hundred years later that a man first succeeded, after many attempts, in reaching the North Pole. He was an American, Admiral Peary. It is interesting to remember, too, that only a few years ago another American naval officer, Admiral Byrd, flew across first the North Pole and then the South Pole in an airplane.

The ship Hudson used in his first voyage was well named — the Hopeful. She was so small that she could carry only ten men and a boy. One of the most surprising things in history is the size of the little ships in which the early explorers made their daring voyages. Few sailors would be willing to go to sea in them today.

One of the tiny vessels Hudson used was named Hopewell, and a third was called the Discovery. These are all good names for ships. In this last-

named ship Hudson discovered both the bay and the strait, in Canada, which are named for him. This was when he was trying to find a northwest passage into the Pacific. Men were sure that there must be one, just as there was a passage at the Strait of Magellan, away down at the southern tip of South America. Hudson did not find this passage, but he did learn that the seas in this part of the world were full of whales. After his voyage, many men went North to hunt them.

Hudson's ship, the Half Moon.

The ship of Hudson's in which we are most interested was named the Half Moon. In her he explored the Hudson River as far as the point where

Albany, New York, now stands. She was a Dutch merchantman, 76 feet long and 17 feet broad, and carried a crew of 16 men. She had three masts, the two forward ones square-rigged, and the mizzen-mast lateen-rigged. She was high at both ends. Her bottom was very nearly flat. Amidships her main deck was just about as broad as it was long. Her stern, narrow at the top, was decorated with a crescent moon, and above it was a little shelter in which stood the man who did the steering. There is an interesting picture of the Half Moon, by N. C. Wyeth, in the Roosevelt Hotel in New York City.

Hudson never returned from his last voyage. His crew mutinied and set him adrift in a frail boat with his son and five sick sailors. They were never heard from again.

In 1909, just three hundred years after Hudson's famous voyage, there was a celebration in the United States. At this time, a ship just like the Half Moon was built and sailed across the ocean. When you go to New York, perhaps you can hunt up this tiny vessel, which has been kept by that city. You will hardly believe that so small a ship could live in such great rough seas as those in the Atlantic.

As you read this book, think about the ways in which ships of various times were similar, and the ways in which they were different. The pictures will help you.

The Mayflower

AFTER the defeat of the Invincible Armada of Spain, English explorers felt safe to sail to America and to make settlements there. Jamestown, Virginia, was settled in 1607. The date 1620 is also one to be remembered, because in that year the Pilgrim Fathers sailed to Massachusetts.

When they started for America, the Pilgrims had two ships, the Speedwell and the Mayflower. They set out from Southampton, England, the port from which many liners now sail, late in July, 1620. But the Speedwell, a rickety old ship, soon sprang a leak and both vessels stopped, so that she could be repaired. Then they sailed again, but after sailing three hundred miles, they found that the Speedwell was not fit to cross the Atlantic.

Plymouth is another English port at which liners often stop. It is also the port from which Sir Francis Drake sailed out to fight the Spanish Armada. Here as many of the Pilgrims as could find places on the Mayflower were taken aboard, and in September she started on her voyage alone. In Longfellow's poem "The Courtship of Miles Standish" there is a part that tells about the sailing of the Mayflower.

The Mayflower carried about 100 persons. She must have been uncomfortably crowded, for she was only 82 feet long and 22 feet broad, thus being even

smaller than the Santa Maria. She was much too tiny a ship to put to sea with the stormy months of the year so close at hand. If we compare her with the largest liners of today, we find that more than three hundred ships the size of the Mayflower would make only one ship as big as the Leviathan.

An English merchant ship of the time of the Mayflower.

There are no books that show exactly how the Mayflower looked. We know only that she was a merchant vessel and fairly good-sized for those times. Artists who have painted her picture, and people who have made models of the Mayflower, have copied the shape of hull and the rigging that was common in 1620. Probably the Mayflower looked a good deal as

our picture shows her. Ships then had blunt bows, three masts, and a long sloping bowsprit, much like those that had been used for a hundred years or more. Below the bowsprit was a big curved beak, not planned as a ram, but as a means of keeping the waves from dashing aboard. There were cabins both fore and aft, and also platforms for a few cannon. There was a gallery around the stern. The bowsprit carried a sprit sail, and there were square sails on the fore-mast and a lateen sail on the mizzen-mast.

If you ever go to the National Museum at Washington, you can see what is supposed to be a very good model of the Mayflower. You can see also a model of the Santa Maria, and it will be interesting to notice that these ships were alike in some ways, but different in others.

The voyage of the Mayflower took sixty-three days, for the ship sailed poorly and the seas were very rough. A great deal of water came aboard, and the passengers, even in their cabins, were wet through and chilled to the bone. In mid-ocean, a fierce storm wrenched her and cracked one of her poor old timbers, so that if it had not been for a huge iron screw that the sailors had, the ship might have sunk. In another storm the Mayflower rolled and tossed so suddenly that a young man was thrown overboard and saved himself only by catching hold of a rope. The

sailors pulled him back to the deck with a boat-hook.

At last, after being driven far off their course, the Pilgrims sighted Cape Cod. They hunted several weeks for a good place to land, and on December 21st set foot on shore at a place that an English explorer had already named Plymouth, after the pretty town in England that the Pilgrims knew so well. But there was not much to remind them of home in the snow-covered wilderness of the New World.

The Mayflower soon sailed back to England. Like steamships of the present day, she found the eastward passage easier than the westward, and she made the return voyage in thirty-one days. We should like to know what became of the Mayflower after that, for no ship means more to Americans than she does. But there is no record of her later voyages.

The Frigate Constitution, "Old Ironsides"

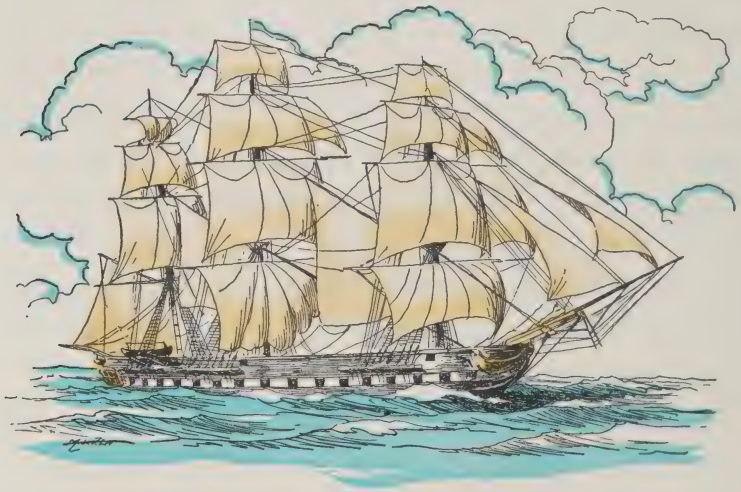
FRIGATE is the name given the medium-sized wooden sailing ships that were used in the early days of our navy, much as the cruisers of the present time are used. One of the frigates that was sent to punish the pirates of Tripoli was the Constitution — one of the most celebrated ships ever built. She was launched at Boston, in 1797, and is still afloat. Of course in all the years since her launching she has

been repaired again and again. Only a year or two ago the latest rebuilding was completed, with new wood and new metal used wherever any part of the ship had worn out. She was given new masts and sails, also. The Constitution now lies at the navy yard in Charlestown, Massachusetts, looking just as she did more than a hundred years ago. She is as strong and seaworthy as ever, and it is planned to take her to different ports in the United States, so that people can see what this splendid old-time warship is like.

All Americans are proud of the Constitution's career, and they are glad that the money needed to rebuild her could be raised. A great many boys and girls in cities, towns, and villages throughout our country sent their pennies, nickels, and dimes to help to finish the work. Perhaps you sent yours. Perhaps you have a picture of this famous frigate in your home, or in your school. The artists Patterson and Grant have made beautiful paintings, showing her under full sail. There are many other good pictures, too.

The Constitution is 204 feet long and 43 feet broad, with a tonnage of 1576. When she was new, some British naval officers laughed at her, saying that she was too clumsy, that her yards were too long, and that her guns were too heavy. But the time came

when British shipbuilders copied her as closely as they could, for the Constitution proved herself more powerful and speedier than any frigate built before her. In 1812 she carried 52 cannon and 400 men.



The American frigate Constitution —"Old Ironsides."

She is painted black, with white deck-houses, and with a broad band of white, broken with square black porthole covers along her sides. Inside she is painted dark red, just as warships used to be when the Constitution was fighting her battles. Her three masts are very tall and carry the sails of a full-rigged ship. If you ever have a chance to go aboard the Constitution, by all means do so. You will get the best possible idea of how our old naval vessels looked, and how the

sailors lived. Also, after you visit this ship, the stories that you read in Abbot's *Blue Jackets of 1812*, or in Stevens' *Boys' Book of Famous Warships*, will mean much more to you.

After the pirates of Tripoli had been punished, the Constitution took part in a short war between the United States and France. She had already won the nickname Old Ironsides, because when she was bombarding a fort in Tripoli some of the enemy's cannon-balls bounced off her thick sides and fell harmlessly into the sea. A sailor cried out, "Hurrah, boys, her sides are made of iron!" The Constitution had also shown her speed when she won a friendly race against a British frigate.

Early in the War of 1812, between the United States and Great Britain, she had adventures in which she needed both her fast sailing and her "iron sides." First she was chased by a fleet of seven British ships and barely escaped; and soon afterwards she caught one of those same frigates alone and fought a furious battle with her. This was the fight with the Guerrière, and you will find the story told in all books about the American navy. Winning this fight was something for American sailors to be proud of, for the Guerrière was one of the finest British frigates and carried a veteran crew. She had been built by the French, who were at the time thought to have the

best ideas about shipbuilding. The British had captured her a few years before. When the Constitution finished with her, the Guerrière was nothing but a helpless wreck.

Four months later, the Constitution fought the British frigate Java, and destroyed her. A year or more after that she was chased by two heavy British frigates and had another narrow escape from capture. Finally, in 1815, the Constitution fought her last fight and won her last victory. This time two British men-of-war surrendered to her. The battle occurred after peace had been declared, but in those days there was no radio or telegraph, so the news had not reached the captains of the ships. After the battle, the Constitution was chased by a pair of big British frigates and needed all her speed and all her captain's skill to escape. But, as usual, she got home safe and sound.

Salem Ships and their Voyages

THE little city of Salem, Massachusetts, more than a hundred years ago, was one of the most important shipping centers in the United States. Her ships went to India, Java, Madagascar, Mozambique, China, Japan, Siam, and many other places. They traded with a greater number of different peoples in Asia, Africa, South America, and the islands of the Pacific than all other American ports put to-

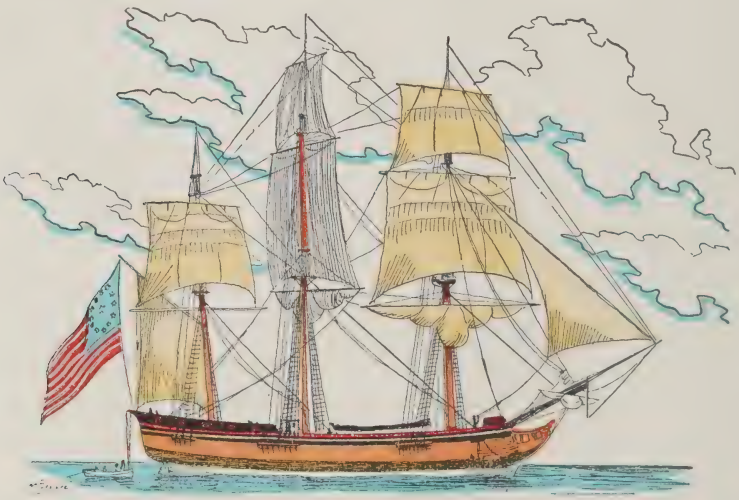
gether. If you ever go to Salem, be sure to visit the Marine Room of the Essex Institute, for there you will see curiosities from all parts of the world, brought home in Salem ships. There is also a splendid collection of paintings and models of ships. You will see more interesting things and learn more facts about old-time American shipping from a visit to this room than in any way we can suggest.

We will tell you a little about some celebrated Salem ships. There was a ship named the George that once came home from Calcutta in the record time of 93 days, and went back in 89. For twenty-two years she sailed between Salem and Calcutta, making one round trip each year. Going out she took usually about 115 days, and coming home she took about 12 days less. At the time when she was making these speedy passages, the lumbering big East-Indiamen, belonging to England, were taking from five to eight months to go from London to India, and back again. Which distance is shorter — Salem to India, or London to India?

The George was a full-rigged ship, like most of the Salem merchantmen. She was painted black, with a band of brightly varnished, unpainted wood along her sides. This was the usual coloring of American ships at this time. They all carried cannon, so that they could fight the pirates that they often met.

Some had a broad white band on their sides, along the line of portholes, with the covers of the portholes painted black.

Other famous ships of Salem were named Columbia, Hercules, Grand Turk, Cleopatra's Barge, Essex, and America. There are stories about them in Paine's *Ships and Sailors of Old Salem*, and colored pictures in *Old-Time Ships of Salem*, a book published by the Essex Institute.



The ship Columbia. Like the brig on page 90, *she has stopped by backing the sails on her mainmast.*

The Columbia was the first American ship to sail around the world. She was also the ship that discovered the river in Oregon now bearing her name. Her voyage was made a few years after the War of the

Revolution, and led to our country's getting control of a large area in the Northwest.

Although the Hercules was no larger than a two-masted schooner of today, she went on many voyages to all parts of the world.

Grand Turk was a name given at different times to several vessels. You can see how it is suited to a ship trading with the East, and it was so well liked in Salem that shipowners used it for one vessel after another. In the War of 1812, a very successful privateer, rigged as a brig, had this name.

Cleopatra's Barge was a private yacht, the first American yacht to cross the Atlantic. She was a brig. The most interesting thing about her is the fact that her two sides were painted differently. The starboard side had lengthwise stripes of different colors, and the port side was painted in the herringbone pattern. After a while the Cleopatra's Barge became a merchant ship and made several voyages to South America. Later she was taken to the Hawaiian Islands, and became the yacht of the native king.

The Essex, which is named for the county in which Salem is located, was a frigate built for the United States Navy. You can read about her cruises in Abbot's *Blue Jackets of 1812*.

The America was a merchantman sailing to the Red Sea. She also served in the War of 1812 with Great

Britain, and proved herself the fastest sailer afloat at that time.

In later years, as bigger ships came to be built, Boston, New York, Philadelphia, Baltimore, Savannah, New Orleans, San Francisco, and other ports that had larger and deeper harbors took Salem's place as shipping ports. Their sailors and shipbuilders, however, learned a great deal from the people of Salem. If it had not been for that little city, our country might never have won its leadership on the seas.

Old-Time Whaling

WHALING was an important industry until about 70 years ago. At one time there were more than 700 American whaling ships in the seas of the North or of the South. Many of them hailed from Massachusetts, where New Bedford, Nantucket, and Provincetown were busy whaling ports. Now there are only about 20 American whalers, nearly all sailing from the Pacific Coast. Most whaling today is done by ships from Norway and Japan. All modern whalers are steamships, built in a special way. Usually they are small, about 96 feet long and 17 feet broad. They carry only 10 men, who work very differently from the old-time whalers.

In the old days, the barque rig was the common one

for whaling vessels. This was because a vessel that has some fore-and-aft sails is easier to handle in seas crowded with masses of floating ice than one having only square sails. When Admiral Byrd went to the South Pole, one of his ships was a barque. She, however, had a steam engine in addition to her sails.

The old-time whaler was not a big vessel. She was about 130 feet long and 26 feet broad. She carried a crew of 30 men. Some of the biggest whales were about two thirds as long as the ships that hunted them. There is a story that once a whaler was sunk by a whale that rushed at her and stove in her side.

The whalers were heavily built and had what is called full bows; that is, their bows were blunt and quite rounded. They had rather straight sides and a square stern. The idea was to give them a lot of storage space. Going out, they carried vast quantities of supplies, and on their voyages home they were filled with thousands of barrels of whale oil and many tons of whalebone. The masts of whalers were rather short and stood straight up, without the rake that the masts of other sailing vessels had. Some whalers could sail fairly fast, but strength rather than speed was what was wanted in these vessels. Most of them sailed slowly, and since voyages took them into distant seas, whalers might be away from home for three or four years. Sometimes, in spite of her stout

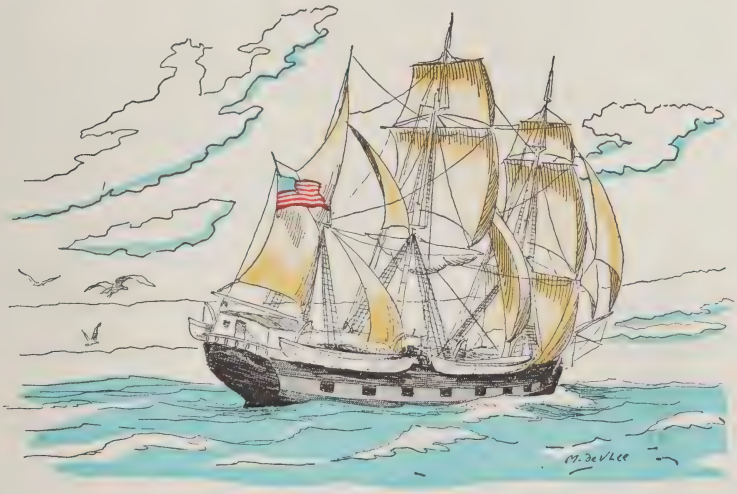
sides, a whaler would be crushed in the ice and sunk.

In a whaling museum in New Bedford there is a collection of the things that sailors took with them on their voyages and things that they brought home, together with many pictures of whaling scenes. In the harbor of South Dartmouth, about ten miles from New Bedford, there is a genuine old whaling barque, the Charles W. Morgan, rigged and fitted out just as she used to be when she set out on a voyage, eighty or ninety years ago. You will enjoy a visit to this ship if you ever find yourself in her neighborhood. You will see more interesting things than it is possible for us to tell you in a book.

We must, however, tell you about the whaleboats, because nothing that the ships carried was more important. Without them a ship could probably never have captured a whale. A whaling ship carried from four to seven whaleboats. They were hung from davits along the two sides of the ship, all ready to be lowered into the water. The davits were heavy bent timbers, shaped about like the steel davits commonly used on vessels of today.

The whaleboats were about thirty feet long and five feet broad. Their sides sloped upward toward the ends, so that too much water could not dash into them while they rushed along towed by the whale. They had rather a flat bottom and a keel. Both the

bow and the stern were pointed, so that a boat could be rowed quickly either ahead or backward. Sometimes one had to dodge very suddenly to escape the mighty blows of a wounded whale's flukes, as the two halves of its tail are called. Usually a whaleboat carried a mast and sail, so that it could get close to a whale without the noise that oars and rowlocks make.



A whaling barque setting out on a voyage.

Whaleboats are now used in other ways. They are the most seaworthy small craft that have ever been invented. They are carried today by many ships in our navy, and a good many people use them for pleasure boats, either with sails or with engines.

They remind us, more than any boats that we are likely to see, of the ships of the old Vikings, about which you read in another chapter of this book.

The work of the old-time whalers was something like this. The ship would cruise around in waters where the whales lived. At the head of the foremast would stand a man, in a sort of barrel, looking about to see a whale spouting. Whales have to come to the surface to breathe, and when they do they blow a column of spray high into the air. Whenever the lookout man saw a whale doing this, he would cry out, "There she blows!" His shout sounded like this, "Thar she bl-o-o-o-ows! Bl-o-o-ows! Bl-o-o-ows!" Then the ship was steered in the direction he pointed. When near enough, the men piled into their whaleboats and rowed close to the whale. In the bow of each boat stood a man with a harpoon, which was a sharp, heavy spear attached to a long, strong line. Six other men pulled on the oars, and another man stood at the stern, steering with an oar. The reason for steering with an oar instead of with a rudder is that an oar can turn a boat that is standing still, while a rudder can turn only one that is moving. Sometimes a whaleboat would have to stop before it quite reached the whale, to avoid making a noise. Whales are not much alarmed by what they see, but they are easily frightened away by what they hear.

At the right moment, the harpoon was thrown. It struck deep into the whale. Away the whale dashed, diving deep into the sea. The line ran out like lightning, sometimes so fast that it smoked. It was loosely coiled in a tub at the stern of the boat and looped around a post called the loggerhead. The line ran through the length of the boat, and out through an opening at the bow. As the line ran out, away went the boat, towed along at great speed by the wounded whale. Sometimes a whale would fight a whole day for his life, and would carry a boat miles away from a ship. But in the end the whale would be killed, and the men would either row back to the ship, towing the whale behind them, or else signal the ship to sail to them by holding their oars straight up in the air. The rest of the work was very hard, for the whale had to be cut to pieces and the valuable parts taken aboard the ship, where it was prepared for storage until the end of the voyage.

Most of the oil was burned in lamps as kerosene is now, and the bone was used in the ribs of umbrellas, in dressmaking, and so on. You will find it interesting to look up other ways in which whale oil and whalebone are used now, and how they were used years ago. You can also find out what is now used in place of these two materials.

Sometime, you will want to read parts of a great

whaling story by Herman Melville named *Moby Dick.* There are many other good stories about whaling for you to read now. Two of the most interesting of these are W. J. Hopkins's *She Blows! And Sparm at That!* and F. T. Bullen's *The Cruise of the Cachalot.*

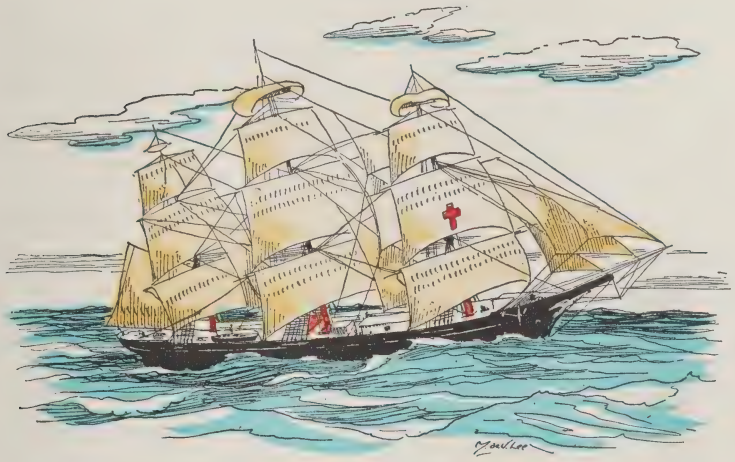
BOOKS THAT YOU WILL ENJOY

"Yankee Ships and Yankee Sailors: Tales of 1812," by J. Barnes.
"Twelve Naval Captains," by M. E. Seawell.
"Famous American Naval Officers," by C. L. Lewis.
"Famous Privateersmen and Adventurers of the Sea," by C. H. Johnston.

XIII. AMERICAN PACKETS AND CLIPPERS

The Packet Ships

ABOUT 1816, a great many immigrants began to come to the United States from different countries in Europe. They were brought across the Atlantic in swift sailing ships called "packets." This name was given to the vessels that sailed regularly between certain ports, just as the liners of today do.



The famous packet ship Dreadnaught.

Before the packet lines were started, all the ships that sailed between Europe and America carried whatever freight they could find, silver, gold, and the mails, but only a few passengers. They sailed whenever they were fully loaded, and did not try to make fast voyages. The packets, on the other hand, were

sailed as fast as they would go, because they carried many passengers, all of whom wished to get to land as quickly as they could.

The packet captains very seldom slowed up for storm or fog. They did not take in sail at night, as the old-fashioned sailors had done. No matter how hard the wind blew, all sails were kept set except in the very worst weather. There is a story that at least one packet captain put padlocks on the ropes, so that no sails could be taken in without the captain's knowing it. On the larger packets, the foremast and the mainmast were each about 160 feet tall, and the mizzen-mast about 125.

The packets were fine sturdy ships. The first ones were about 120 feet long and the later ones were twice as long. Their breadth was about one fifth their length. They usually had two decks, and every inch of space that could possibly be used for the purpose was made into bunks in which the immigrants slept. There was also a deck-house which was divided into cabins for a few first-class passengers. The ships were almost always painted black above the water line, and had brightly varnished bulwarks, masts, and yards. Inside, they were painted light green.

The best packet ships were American, and there were several lines. The most important one was the

Black Ball Line, which had for its house flag a red pennant shaped like a swallow-tail, with a big black ball on it. Each of the vessels of this line had a big black ball painted on its fore-topsail. There was also the Red Cross Line, to which the famous ship Dreadnaught belonged. If you see a picture of a ship with a red cross on her fore-topsail, you can be quite sure that is the Dreadnaught, because more pictures of this ship have been painted than of any other packet. Sometime you will want to read a book named *From the Forecastle to the Cabin*, by Captain Samuels, who was the commander of the Dreadnaught for many years. He made some very fast passages and was a very skillful sailor. He tells about many exciting experiences.

Some of the other lines of packet ships were the Swallow-Tail, Red Star, Black X, and Jewel. The last-named owned ships called Amethyst, Emerald, Sapphire, and Topaz. Most lines had two sailing days each month from some American port, usually either Boston, New York, or Philadelphia, and two from Liverpool, England, or Havre, France. The eastward voyage generally took about twenty-three days, and the westward, forty days. Once in a while a packet crossed from Boston to Liverpool in sixteen days, or perhaps a day or two less.

The immigrants had to bring their own food, and

they had to cook it themselves, at the ship's "galley," or kitchen, on deck. You can imagine how crowded their living quarters were. The people were packed in almost like sardines, and each one had with him, not only some personal belongings, but a bundle of things to eat. Food for the first-class passengers was supplied by the ship. In those days there were no cold-storage holds for fresh meat, and there were no canned provisions. To supply meat, the ship carried a regular farmyard. A big lifeboat on deck was roofed over and made into a shed, in which were kept live animals, such as sheep and pigs. There were coops for hens, chickens, ducks, and geese. The ship carried also a cow or two, to provide fresh milk. On some packets, there was even a small kitchen garden in which fresh vegetables were raised.

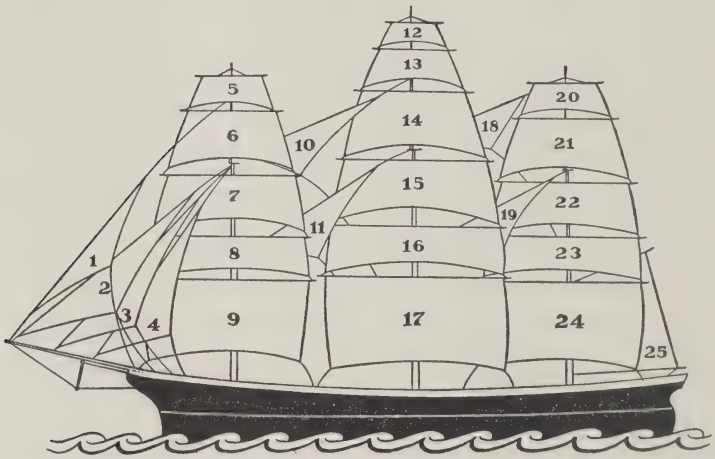
In those days there was no way of heating ships by steam or electricity, and at night the only light in the cabins or on the decks was furnished by candles or whale-oil lamps. Travelers must have been quite uncomfortable, but if you should read the newspapers of that time you would find glowing accounts of the way the ships were fitted up. How astonished the people of a hundred years ago would be if they could see the beautiful, fast, comfortable steamships of today.

The Clipper Ships

AMERICAN shipbuilders have always tried to build the best ships afloat. They have usually succeeded. We have been reading about the packets, which were a great improvement over the sailing ships of earlier days. Now we come to the story of the most perfect full-rigged sailing ships that the world has ever seen. These are the American clipper ships.

In 1845 there was launched in New York a little ship named the Rainbow. She had been designed by a young man who had new ideas about the shape of a ship's hull. He built the Rainbow with a much sharper bow than any other ship had had, and he made other changes that he thought would increase speed. Old-time sailors laughed at his ideas, but the young man proved to be right. Ships built according to his plans were the speediest sailers ever known. In earlier ships, built more or less like the East Indiamen or the whalers, the sides had curved outward at the water-line. The sides of clippers curved inward at the water-line, so that these ships cut through the water like a knife. Also, a clipper was usually between six and seven times as long as she was broad. In the packets, which were the swiftest sailing ships up to the time of the clippers, the length had been only four or five times the breadth. All these new ideas added to the speed of the clippers, and so

did their great sails. They spread more canvas, as the sailors say, than any other ships had done. One famous clipper made an hour's record of twenty-one knots. That is as fast as most of the liners of our day travel. It is much faster than the cargo boats and tramp ships.



The sails of a full-rigged ship

1. *Flying jib.* 2. *Outer jib.* 3. *Inner jib.* 4. *Fore-topmast-staysail.* 5. *Fore-royal.* 6. *Fore-topgallant-sail.* 7. *Fore-upper-topsail.* 8. *Fore-lower-topsail.* 9. *Forecourse.* 10. *Main-topgallant-staysail.* 11. *Main-topmast-staysail.* 12. *Main-skysail.* 13. *Main-royal.* 14. *Main-topgallant-sail.* 15. *Main-upper-topsail.* 16. *Main-lower-topsail.* 17. *Main-course.* 18. *Mizzen-royal-staysail.* 19. *Mizzen-topmast-staysail.* 20. *Mizzen-royal.* 21. *Mizzen-topgallant-sail.* 22. *Mizzen-upper-topsail.* 23. *Mizzen-lower-topsail.* 24. *Cross-jack.* 25. *Spanker.*

In the Little Dictionary for Sailors, at the end of this book, look up Courses, Masts, Sails, Stays and Yards.

The first American clippers were used to carry tea from China to Boston or New York. When one of

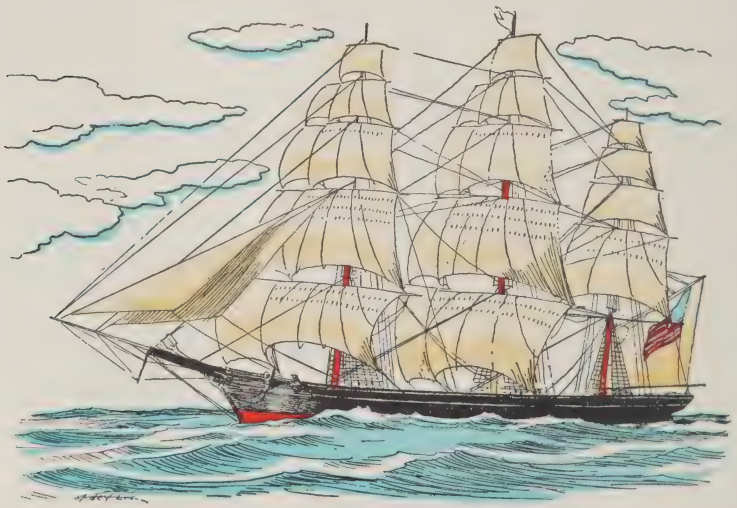
them, named Sea Witch, sailed from New York on her maiden voyage, people said she was the handsomest ship under the Stars and Stripes. She was painted black, with a band of bright red along her sides. She was in the China trade and so she had an immense gilded Chinese dragon for a figurehead. Her three towering masts, set with quite a rake, were white with canvas. In all she could carry thirty-four sails. No more beautiful picture can be imagined than such a ship with outspread sails racing over the flowing seas.

The most famous clipper-ship builder of his time was an American named Donald McKay. He not only built the fastest and the sturdiest ships on the ocean, but he built a greater number than any other one man. Many people think that his ships were the most beautiful ones that ever sailed the seas.

McKay had begun his career by building packet ships, some of which sailed between Boston and Liverpool, others between New York and Liverpool, and still others between our southern ports and Europe. One of his fast packets once caught up with a paddle-wheel steamer in mid-ocean, and very soon passed her and went out of sight ahead.

When clipper ships came to be built, most of McKay's vessels were used on the routes between New York and San Francisco, between California and the

East Indies or China. Some were built for English owners, and sailed to Australia or China. You see that the special difference in the use of packets and clippers is that the packets made rather short voyages, while the clippers made long ones to the most distant parts of the world.



The beautiful clipper ship, Flying Cloud

After gold was discovered in California, the route from New York around Cape Horn became very popular. In 1849 and 1850, 760 vessels from American ports alone "rounded the Horn." As many clippers as possible were used on this route because of their speed. Great hordes of people joined in the gold rush, hoping to make their fortunes in a few

days. They chose the long ocean voyage because they dreaded the dangerous journey overland in the covered wagons known as prairie schooners. They preferred to face stormy seas rather than bands of hostile Indians. Then, when gold was discovered in Australia, four or five years later, there were plenty of other people, both in the United States and in England, who filled the clippers sailing to the new gold fields.

Some of McKay's most remarkable ships had interesting names, such as Flying Cloud, Flying Fish, Sovereign of the Seas, Great Republic, Westward Ho, and Lightning. In less than twenty-five years, McKay built more than forty clippers, ranging in size from the Courier of 380 tons to the Great Republic of 4555, which was the largest sailing ship of her day. The Great Republic measured 325 feet by 53. Her mainmast was 205 feet high, as tall as a building of twenty stories, and her longest yard measured 120 feet from tip to tip, reaching far out beyond the sides of the ship.

Of all McKay's ships the Lightning proved to be the fastest sailer, for she set a record of 436 miles in 24 hours. No steamship of the time equaled her speed of 18 knots. The best day's run of a steamship in those days was 394 miles. See if you can find out how this record day's run of the Lightning compares

with the usual run of an Atlantic liner of the present day.

The Flying Cloud twice sailed from New York to San Francisco by way of Cape Horn in 89 days. No other sailing ship has ever beaten this record.

Longfellow's poem "The Building of the Ship" celebrates the building and launching of one of McKay's clippers.

There are many beautiful pictures of clipper ships. Those painted by the English artist, J. Spurling, and by the American, C. R. Patterson, are probably the most true to life. Each of these men has been a sailor, and each knows exactly how to paint a picture of a ship. Gordon Grant is another artist who has made many sea voyages, and whose ship pictures are very interesting. On page 275 we give you the titles of books in which you can find copies of paintings by these three artists. You may think that all ships looked very much alike, but as you study pictures by the best ship artists you will find that really there is as much difference in the appearance of ships as there is in the appearance of people. It will be great fun if you can learn to tell by looking at a picture what ship it is, without first reading the name that the artist has written underneath. Sometimes you will be able to tell from the color of the hull, or by the way the masts rake, or else by the way her sails are set.

There is a magazine named *The Blue Peter*, published every month, which has on its cover a painting of some well-known sailing ship. Perhaps you can find some copies of this magazine in your public library. They are all well worth looking at. One of the stories in the magazine is always about the ship pictured on the cover.

Clipper ships were painted in any color that pleased their owners. They might be black, with a narrow line of color along their sides, or with a broad white band marked off with squares of black to look like the portholes of a man-of-war. There were some green clippers, some gray, and a few white. Usually the bottom, below the water-line, was dark red. The rails and deck-houses of clippers were likely to be either white or a creamy yellow. Their lower masts might be either white or the color of the natural wood brightly varnished. From these hints, you can decide how to paint your clipper ship model, if you make one.

The English, as well as the Americans, learned to build splendid clippers, and there was great rivalry between the shipbuilders and sailors of the two countries. Often, when clippers started off on the same voyage, there were races between them. Perhaps the race most worth knowing about is one between five English clippers, carrying tea from China to England. Their names were Ariel, Fiery Cross, Serica, Taeping,

and Taitsing. Some of them left Foochow, in China, on May 29th and the rest on May 30th. It was agreed that the race would be won by the ship that reached London in the fewest days. For a large part of the long voyage, several of the ships were in sight of one another. First one ship would catch a favorable wind and sail ahead of the others, and then she would run into a light breeze and watch another ship catch up with her and pass into the lead. At other times, all the ships would be out of sight of each other and the captains could only guess which one was in the lead. No one could tell until the last day which ship would finally reach the London docks first.

How close together do you suppose the ships were at the end? Well, the Taeping won the race by getting into the dock twenty minutes ahead of the Ariel. Just think of it! The ships had raced thousands of miles and there was only that tiny difference in the time they took. The third ship to arrive was the Serica, and she came in only about three hours later. The Fiery Cross arrived the next day, September 7th, and the Taitsing on September 9th. The three ships that led the race had sailed from Foochow to London in ninety-nine days each, and the two that brought up the rear had taken only two days longer.

The year 1869 was an unfortunate one for clipper ships, for in that year came two events that had a

good deal to do with the disappearance from the seas of these beautiful ships. Each of these events shortened the time needed to travel to California and to Australia and China.

For one thing the Suez Canal, after ten years' work, was finished. It joined the Mediterranean Sea with the Red Sea, and so made the trip around Africa unnecessary. Steamships could use the new shorter route through the canal, but sailing ships could not. A steamer can steer a perfectly straight course, because she does not depend on the wind. A sailing vessel, however, requires more width of water than there is in a canal, because she depends on the wind and has to go ahead by a series of short zigzags or "tacks" to right and left, except when the wind comes from behind. So, since they could not sail through the Suez Canal, the clippers had to keep on using the long, slow route around Africa. Thus the voyage from England to China became 5000 miles shorter for steamships than it was for the clippers.

The other unfortunate thing for the clippers was the opening of the first railroad across the United States. This joined the Atlantic Coast with the Pacific. People were now able to travel from coast to coast in far shorter time than the three months that the fastest clippers took. So, after about twenty-five years of glorious voyaging, these beautiful sailing ships began

to vanish from the seas, over which they had reigned as queens.

When steamships became common, there was less and less work for sailing ships. Today, there is not a single old-time clipper under the American flag, and only one or two in the whole world. In the harbor of Falmouth, England, lies at anchor the last of the English clippers. She is the Cutty Sark, a ship very famous in her day, whose story you will find in many books.

BOOKS THAT YOU WILL ENJOY

"Historic Ships," by R. S. Holland.

Chapter XVIII, "The North Atlantic Packets"; Chapter XXII, "The Darling of the Seas — the Clipper Ship."

"Down to the Sea in Ships," by I. Anthony.

Chapter XVII, "Packet Days"; Chapter XVIII, "The American Clipper Ships"; Chapter XIX, "Tea and Wool Clippers."

"The Tale of our Merchant Ships," by C. E. Cartwright.

Chapter IX, "The North Atlantic Packets"; Chapter XI, "The Lordly Clipper Ships."

XIV. THE STORY OF STEAMSHIPS

Robert Fulton and the Clermont

NEARLY a hundred and fifty years ago, John Fitch, the son of a Connecticut farmer, made a steamboat which actually ran on the river at Philadelphia. It must have been a very odd-looking boat, because on each side it had a row of oars which were fastened to a steam engine. As the engine worked, it forced these oars through the water, a good deal as people nowadays paddle a canoe. This boat was too clumsy to be a success.

A few years later, some men in England built a steam tugboat that was driven by a wheel placed at the stern. She was named Charlotte Dundas in honor of a daughter of the man who paid for building the boat. She was intended to be used on a canal and seemed likely to give good service. The owners of the canal, however, feared that the waves caused by the revolving paddle wheel would rush against the banks of the canal and injure them. So the Charlotte Dundas never had a real chance to show what she could do.

Robert Fulton was an American who at this time was in London, studying to be an artist. He became interested in the problem of how to make a steamboat. He saw the Charlotte Dundas, and soon afterwards tried his hand at making improvements in her, using a boat which he himself planned. Fulton returned to the United States, and in 1807 he launched upon

the Hudson River the famous steamboat named Clermont. Most people did not believe she would do what was expected of her. They called her "Fulton's Folly."

The first steamboat on the Hudson River. Fulton's Clermont.

A man who watched the Clermont steam slowly up the Hudson on her first trip to Albany said that she looked exactly "like a backwoods sawmill mounted on a scow and set on fire." She certainly was ugly to look at. She was long and very narrow, 175 feet by only 12. The central part of the boat was open, with a small cabin at the bow. There were two masts, so that sails could be used if the engine broke down; and there was a tall smokestack, or funnel, that sent out great puffs of dense smoke. There were double

paddle wheels on the two sides, each fifteen feet across. These were made to revolve by a lot of clumsy and noisy machinery.

The Savannah, the first ship to use a steam engine on the ocean.

In spite of her crazy looks, however, the Clermont made the voyage successfully. She ran the 150 miles from New York to Albany in 32 hours, going against the current of the river. The return trip, with the current, was made in two hours less time. The Clermont was put into regular service on the Hudson, and before many years there were steamboats more or less like her on a number of other rivers.

An exact duplicate of the Clermont was built a few years ago, as part of the celebration of the hundredth

anniversary of Fulton's invention. She worked just as well as the original boat did, and as she steamed slowly up the Hudson, it was interesting to compare her with the modern steamers that are used there. Can you find out how long it takes the big steamers of the Hudson River Day Line to make this same trip?

The Savannah

TEN years after the Clermont, the first river steamboat, a ship crossing the Atlantic used paddle wheels driven by a steam engine. This was the Savannah, a full-rigged sailing ship, measuring 120 feet in length by 29 in breadth. You will be interested in comparing these measurements with those of the Leviathan.

The Savannah was designed to sail as a packet between New York and Havre. She was bought by some shipowners from the city for which she was named, while still being built in New York. They fitted her out with a steam engine and with paddle wheels that could be hoisted on deck when not in use. Then they sent her to sea.

The Savannah sailed on May 24th and anchored in the Mersey River at Liverpool 29 days and 11 hours later. How does this time compare with the average time made by the packet ships? It is hardly fair to compare it with the time made by the liners of today,

because the Savannah did not use her paddle wheels all the way across. In fact, she ran her engine for only about 80 hours. Most of the 3000 miles or so of the voyage were traveled under sail.

The fuel was mostly wood, although a little coal was burned. The wood caused a great deal of smoke. When an English revenue cutter first sighted the Savannah off the coast of Ireland, her captain thought that he was looking at a ship on fire. He sailed to the rescue as fast as he could, but much to his surprise he was not able to overtake this ship "under bare poles" — that is, with no sails set. He chased the Savannah all day, and finally had to give up.

The First Ocean Steamships

ONE day in April, 1838, many people in New York City gathered in groups along the water-front and looked eagerly out to sea. Packet ships had recently brought news that early in the month two steamships had left different ports in England on a voyage to New York. The time was drawing near when these vessels ought to arrive.

At last, after long waiting and watching, some one spied what seemed to be a little wisp of smoke on the horizon. Some of the watchers insisted that it was a sea gull; but after a few hours, first the masts and then the funnel of a steamship came into view. Soon

the whole vessel could be seen. People knew that she was either the Sirius or the Great Western, the two English ocean steamers that were so eagerly expected, but for a while they couldn't be sure which one it was. When the ship got near enough, she was seen to be the Sirius. She had made the voyage from Queenstown in 16½ days.

At the start her crew had been discouraged by slow progress through stormy seas, and had wanted to turn back. The captain had insisted on finishing the voyage; but before he got to New York he had used up all the coal. To keep up steam in the boilers, he had been obliged to burn the ship's extra spars and barrels of resin from his cargo.

A little later that same day, another trail of smoke was seen in the sky. This came from the other steamship, the Great Western. She had left Bristol, England, 5 days after the Sirius had left Queenstown. Her voyage had been 260 miles longer than that of the Sirius, and she had made it in 13½ days. Every one was surprised to have the two ships reach port so near together. There was a great celebration in New York. Cannon were fired, bells were set ringing, and everybody was happy. The ideas of Americans had proved to be right. Robert Fulton, you remember, was the first man who built a steamboat that would work in a satisfactory way. The ship Savannah had

been the first vessel to use Fulton's steam engine and paddle wheels on the rough waters of the ocean. Now, years later, here were two ships that had come all the way across the Atlantic under power from their steam engines.

These ships did not look at all like the ocean liners that we see at our docks. In the first place, the Sirius was only 178 feet long and 25 feet wide. Then, she had two big paddle wheels, each measuring 24 feet across, and she had two masts. The foremast was rigged to carry three square sails, while the one near the stern was rigged for fore-and-aft sails. The bow of the ship was shaped like a schooner's, and carried as a figurehead a dog holding a star between his fore-paws. You will be interested to find out why this was suitable for a ship named Sirius. Look it up in a book about stars.

The Great Western was a somewhat larger steamer. She was 236 feet long and 35 feet wide. Her paddle wheels were about 28 feet across. She had four masts, all of which had fore-and-aft sails. The foremast had also a square topsail. She was named Great Western because she belonged to a railroad of that name which was then being built in England.

This was the beginning of ocean steamships. At first they all had masts, so that they could use sails if the seas were so rough that the engines could not

drive the ship. Once in a while the engines broke down, but as time went on, they were improved and could be depended upon through the whole voyage. The early steamships all had paddle wheels, one on each side, because the screw propeller like that used today was not invented until several years after.

Only a few passengers sailed on the early steamships. People were a little shy about traveling in the new-fashioned "steam boxes" as they called the steamers. They were afraid that the boilers might blow up, or else that the ships might catch on fire from the furnaces. For a long time the fastest packets and clippers made just as quick passages as the steamers did. But sailing vessels were always at the mercy of the wind, and sometimes one would take thirty or forty days, or even more, in crossing. When people became satisfied that steamships could be depended upon to be as safe and as speedy as a sailing ship, most of the passengers and most of the freight were carried across the ocean in the new-fashioned vessels.

This meant the end of the beautiful clippers and of the packets also. Americans had built most of these older types of ships. There were two reasons for this; first, Americans were the best shipbuilders in the world; and second, nearly all ships were built of wood, of which there was an endless supply in Ameri-

can forests. The English, however, came to be the builders of most of the steamships. The reason was that iron was beginning to be used instead of wood for the hulls of ships. One reason for using iron was the discovery that it was not possible to use wood for the hull of ships larger than a certain size. A very long wide ship would have space enough for an immense cargo, but she would not be strong enough to carry it. If shipbuilders used iron, they could make larger ships and also stronger ships. Larger ships had to be built, because trade was constantly increasing and the cargoes that ships had to carry were steadily getting larger.

The strength of iron ships was proved by one that was driven ashore on the coast of Ireland by a very heavy gale. She lay on the rocks for nearly a year, hammered much of the time by stormy seas. Finally she was put afloat again, and was found to be only a little damaged. One or two wooden ships that had been wrecked in the same gale and near the same spot were beaten to pieces long before the iron ship was saved.

When iron ships began to be built, steel was needed for their machinery. Later, steel, instead of iron, came to be used for the hulls also, because it was found to be both lighter and stronger. England for many years was far more advanced than the United States

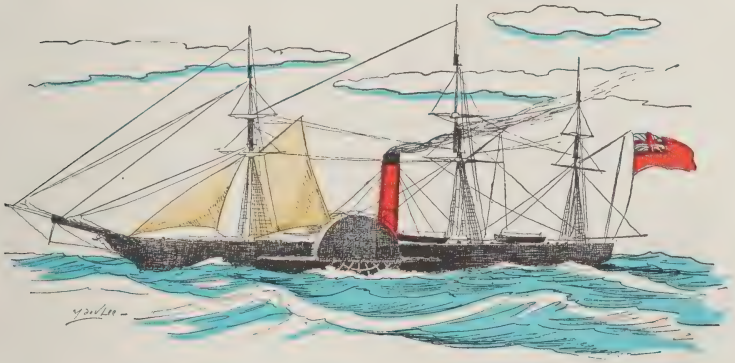
in the making of iron and steel, so she was able to go ahead of our country in the building of steamships.

Today, we are happy to tell you, our country is building ships of steel just as fine in their own way as were our famous packets and clippers. We have not only caught up with England in modern shipbuilding skill, but we are gaining on her in the number of ships that we own, and in the number of passengers and the amount of freight that these ships carry over all the oceans of the world.

The First Liners

THE first regular liners between England and the United States began their sailings in 1840. These were the English steamships of the Cunard Line. Four ships just alike, called sister ships, were built, and the names given them were Acadia, Britannia, Caledonia, and Columbia. These names were chosen for very good reasons. Britannia is another name for England, just as Columbia is for our country. Caledonia is another name for Scotland, the country where the ships were built. Acadia is a part of Canada, and the Cunard liners were to touch at two Canadian ports as well as at Boston and New York. You will notice that the name of each of these ships ends in "ia," just as the names of the modern Cunarders do.

Sometimes Cunard ships bear names that you will not find on the map. Aquitania, for example, was the old Roman name for a part of France. Berengaria was the name of the queen of King Richard, the lion-hearted, of England. Mauretania was the ancient name for a part of Africa. Other Cunarders have been named for the names of present-day countries, or parts of countries, like Arabia, Franconia, and Laconia.



The Britannia, one of the earliest Cunard liners.

The four little steamers of 1840 were very small in comparison with those of the present, being only 207 feet long and 34 feet broad. All four of them could be put on the upper deck of the Leviathan without being crowded. They looked very different, too. They were driven by paddle wheels and had three masts, each of which was rigged to carry both square

and fore-and-aft sails. They had also bowsprits and jibs, like the sailing packets and clippers.

These ships had regular sailing dates for their voyages between England and the United States, and they carried passengers, mail, and freight. In good weather their speed was about nine knots.

The Britannia made the first voyage, which began on the Fourth of July, 1840. She took fourteen days and eight hours to cross from Liverpool to Boston, which was thought a very satisfactory trip. For many years she was a favorite steamer with Atlantic voyagers.

A few years later, the Britannia had an unusual experience. During the coldest winter for fifty years she was frozen in at her dock in Boston Harbor. On the day when she was due to sail for England, February 1st, she was held fast in ice seven feet thick. Even several miles out toward the ocean, the waters through which the ship must pass were frozen two feet deep. When the merchants of Boston realized that the Britannia could not put to sea, and that the mails would be delayed, they raised a large sum of money and hired men to cut a channel through the ice. Very rapidly a passage seven miles long and one hundred yards wide was made, and the Britannia steamed out of the harbor only two days late.

The Screw Propeller

PADDLE WHEELS were used on ocean steamships for many years. Some of them were very large, as much as forty feet across. At last they were given up, partly because when a ship rolled in heavy seas she was too likely to lift first one wheel and then the other out of the water. This strained the ship very badly.

Two Americans, John Fitch and John Ericsson, had a good deal to do with improving the screw propeller. When it was first tried, seamen would not believe that a screw propeller could drive a big steamship. A test, however, proved that it gave more power than the paddle wheels. Two steamers were fastened together, stern to stern. One had a new-fashioned propeller and the other had paddle wheels. The engines of the two ships were started running with their full force, and presently the one with the propeller began to draw the other one backward through the water. After that, the screw propeller came into general use except on rivers and lakes and on short voyages along the coast. You will still see paddle wheels on steamships used in this way. The glass-bottomed sight-seeing steamers used in going to the submarine gardens near Santa Catalina Island, California, or in trips from Miami, Florida, are examples of modern steamers where paddle wheels are

better than propellers would be. Probably you have seen other paddle-wheel steamers near your own home.

The first steamships using the screw propeller had only one. Today, too, there are "single-screw" ships. But there are also a great number of "twin-screw" ships, and some that have either three or four screws. If a ship has one propeller, it is set in line with the keel, just in front of the rudder. If she has two propellers, one is set at each side, close to the stern. Three propellers are arranged one in line with the keel, and one on each side. Four propellers are set in two pairs, one pair on each side.

The earliest propeller had wooden blades. The latest ones are made of heavy bronze, and on the big liners each propeller has four blades. These blades are six feet or more in length. The Aquitania is one of the steamships having four propellers. They weigh, together, sixty-five tons.

The Great Eastern

ONE of the most talked-of ships ever built was the Great Eastern, which was launched in 1858. She was about six times the size of any other steamer then afloat. Her name came from the plan to use her on the route from England to Australia. Her builders made the ship big enough to carry coal enough for the whole long voyage. Smaller ships had

to stop four times or more to take on more coal. There were not many coaling stations, and besides that, it took several days to put on coal if a ship found a port where she could get it. The Great Eastern never made the voyage to Australia. She was put into service on the Atlantic, but was not successful.

The Great Eastern would not look very big alongside the largest steamships of today, but in her time she was considered an immense vessel.

On one trip she carried only thirty-seven passengers, who must have felt quite lost in so huge a ship. Finally, a good use for her was found, when the Americans were ready to lay a telegraph cable from our country to England. No other ship was big enough to carry in her holds the 3000 miles and more of cable that were needed. The Great Eastern, therefore, undertook the work and did it successfully.

Nearly fifty years passed before a ship bigger than the Great Eastern was built. You will be interested to see how she compared in size with such ships as the Leviathan or the Majestic, the largest ones in the world today. As you read the newspapers, you will find accounts of still larger ships now being built by American, English, French and Italian lines.

The Great Eastern was 692 feet long and 82½ feet broad. Her tonnage was about 18,000. She was an odd-looking ship, for she had five funnels and six masts. She had both paddle wheels and a propeller, but she never made the speed her builders expected, because her engines were not strong enough. People now realize that the Great Eastern was built years ahead of her time. She was a very strong vessel; and from her, builders learned much about the best way to build ships in the future.

All modern steamships now have double hulls. That is, there is one steel shell built inside another, with space between them. They are also divided into small water-tight compartments, so that if the bottom of a ship is pierced, the water can get into only one small part of the vessel. The Great Eastern once ran upon the rocks and tore a great long hole in her outer hull. She was dragged off the rocks and, instead of sinking, she was able to steam home because she had a double hull. This taught shipbuilders that it was wise to give ships a double hull.

New Machinery

THE most powerful engines used today are called turbines, which in many steamships have taken the place of the old sort of engines. Another kind of modern machinery is the oil engine known as Diesel, after the man who invented it. This is something like an automobile engine, but it does not burn gasoline. Ships that have Diesel engines often have one very short fat funnel like the Chichibu Maru, the Vulcania, or the Saturnia. The first ones built did not have any funnels at all, because there were no great clouds of smoke to be carried off. As we have told you, however, people like to see funnels on an ocean liner, so nowadays motor ships, as we call them, are made to look more like steamships. Some motor ships, like the St. Louis, the Milwaukee, the Augustus, or the Britannic have two funnels.

Many liners today burn oil rather than coal for fuel, even if their engines are run by steam. A few ships are driven by electricity, made by huge motors which are themselves worked by oil engines. So many new ideas are being introduced into ocean liners that to keep up with the times you must read about them in other books, larger than this one, and in newspapers and magazines. You will find a list of a few of the most interesting books at the end of this chapter.

How Steamships have been Improved

IN our chapter about the clipper ships, we told you how a young man taught both the Americans and the English how to build better and faster sailing ships. This same man, when steamships came to take the place of the clippers, tried his hand at building better and faster steamships. His name was John Willis Griffiths, and he deserves to be remembered for all he did to improve shipbuilding. An American line, called the Collins Line, had been started to compete with the Cunard Line. For them Griffiths built four splendid ships. These were named Atlantic, Arctic, Baltic, and Pacific, after four of the great seas of the world. They were larger and faster than any other steamships then afloat, and they were fitted out to give travelers a more attractive home on shipboard than ever before. Among other improvements, they were the first ones to be steam-heated. This was a great comfort to the passengers, because the Atlantic can be a very cold place, even in summer. The old-time packets and clippers and the early steamships had no way of being properly heated.

As the years passed, business grew, so that all the steamship lines kept building larger and faster steamships. One of the Cunard Line's famous ships was the Servia, the first on the Atlantic to be fitted with electric lights in place of the old-fashioned oil lamps.

Just imagine what a great improvement this was. Today the Cunard Line has such swift giants as the Mauretania, the Aquitania, the Berengaria, and many other smaller ships, all of which have every modern convenience. At the end of Chapter I we gave you a list of some of the books in which you can find stories and pictures of the Cunard liners, the White Star liners, and other wonderful ships that come to American ports.

A great many of the finest steamships of today fly the flag of our country. In all there are eighty-two different American lines engaged in foreign trade. This number does not include coastwise steamers, tramps, or oil tankers, but only ships that carry freight and passengers across the ocean on regular routes. Our ships go wherever any steamship goes. They sail from no fewer than 64 American ports, and visit more than 600 foreign ports in 128 different lands.

The United States Shipping Board publishes a very interesting map of the world on which are marked the routes followed by American ships to the important ports of North and South America, and to those of Europe, Africa, Asia, Australia, and the islands of all the seas. If you can look at a copy of this map, you will get the best possible idea of the steamship routes of the world. On most of these routes travel not only our own ships, but the liners of the other important

seaboard countries, Great Britain, France, Italy, Germany, Holland, Japan, and others.

Modern ships are very different, indeed, from those of your grandfather's boyhood. You will be interested to find out how these ships are built, how they are launched, and what their engines are like. You will be proud to read about the splendid ships of the United States Lines, for there are no finer ships afloat. Each new vessel goes ahead of the older ships in one way or another. American builders are holding their own with those of other countries.

BOOKS THAT YOU WILL ENJOY

"The Book of the Ship," by G. G. Jackson.

Chapters IV–XVI inclusive tell the story of steamships. Chapter XXVI tells about motor ships, and Chapter XXVII about electric ships.

"The Book of Ships," by E. Protheroe.

Part II, "Steamships."

"Ships," by F. C. Bowen.

Chapter VII, "All Sorts and Conditions of Steamers."

"Historic Ships," by R. S. Holland.

Chapter XXV, "Ships of the Modern World."

"Down to the Sea in Ships," by I. Anthony.

Chapter XXI. "The Surrender to Steam."

"Ocean Records."

A booklet full of interesting facts about ocean liners and the sea. There are colored illustrations of steamship funnels, house flags, and signal flags. It is published by the Mentor-World Traveller, New York.

Many of the other books listed on page 19 also contain chapters about steamships, with interesting illustrations.

THE THIRD PART

WHAT ALL YOUNG SAILORS SHOULD KNOW

XV. HELPS FOR SHIPBUILDERS

How to Make Block Prints

PROBABLY you have often drawn or painted pictures of ships, to use as illustrations in your own Ship Book. Suppose that some day you were to draw a picture so attractive that many of your friends asked for copies; would you know an easy and quick way of making them?

Let us tell you how to make linoleum block prints. Then if you ever wish to give away a number of exact copies of any picture you will know how to go about it.

You will need a piece of battleship linoleum. You can cut it the size you want in this way. Draw along the edge of a ruler and mark out a rectangle 6 inches by 9 inches. With a sharp knife, cut along the lines; then fold the edges back until the burlap on the back tears. If necessary, use a paper cutter, just as you would in cutting heavy paper.

You may make your picture in several different ways. You may draw it on the linoleum with chalk; you may paint it with ink; or you may first draw the picture on paper and transfer it on to the linoleum with carbon paper. But in any case plan to make your picture a very simple one. Do not try to show every little detail of the ship. Such a picture would be much too hard to cut out and would surely be disappointing. You will probably want a border around the edge of your picture. It is well to mark this on

early so that you will not forget it. A border half an inch wide is about right.

The next step is to take either a sharp linoleum block cutting tool, a small gouge, or a good paring knife, and outline the picture with rather deep "ditches." Do not forget to make some waves. Your ship will look queer if there is no water around it.

Next, you will need to cut away the background. Work carefully and do not go too fast or cut too deeply.

When the cutting is entirely done, take a paint brush and spread poster paint or printer's ink over the raised surface. Then lay the paper or cloth on which you wish to print your picture on top of the linoleum block and run a rolling pin back and forth over it several times. Then peel off the paper or cloth carefully and lay it aside to dry. If you are going to make a great many prints, it will be easier and quicker to run the paper and the linoleum block through an old-fashioned clothes wringer, if you can get one.

You will need to put fresh paint or ink on the linoleum block each time you wish to print a new picture. Dark colored paint or ink is best — black, blue, or purple. The paper may be any color but the light shades are most attractive — yellow, light green, blue, or gray.

Building Little Ships

WE suppose that you, like most boys and girls who love ships, enjoy building little ships of your own — tugboats, schooners, liners, tramp ships,

and so on. Perhaps you want to become so good a shipbuilder that by and by you can make models of the Santa Maria, the Mayflower, clipper ships, or racing yachts. The boys and girls whom we mentioned in Chapter I have worked out for themselves a number of ideas that are likely to prove helpful to other young shipbuilders, especially those who are wondering about the way to begin, or who perhaps are puzzled in finding out how to do certain things that come later. You will find these suggestions on the next few pages.

What Shall I Work With?

Tools. You will need a few good tools. If your father has a work bench he probably already has the ones that you will need most often. You can do very good work with a smaller equipment, but you will find that each of these tools listed has a special use.

- Bit brace (with bits $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$, and $\frac{3}{4}$ in.)
- Block plane
- Chisel
- Claw hammer (10 oz.)
- Coping saw with a dozen extra blades
- Crosscut saw
- Gimlet ($\frac{1}{8}$ in.)
- Rip saw
- Rule
- Sandpaper
- Screw driver
- Small clamp, vise, or hand screw
- Tin snip
- Wood rasp (half round)
- Wooden mallet

Here are a few other tools that you may well add to your kit from time to time:

- Carving gouge (No. 7)
- Files (*flat*, for use on straight edges; *rat-tail*, for small holes or notches; *half-round*, for large rounded edges).
- Pliers (6 in. "side cutting.")
- Sloyd knife
- Smoothing plane
- Spoke shave

Take care of your tools and keep them always in good condition. Something else to remember is this: — when you use a chisel, a gouge, or a knife, be sure never to pull or push the sharp edge toward you. Always keep your hands back of the edge or point. If you are careful to do this you will never cut yourself.

Nails, Screws, etc. You will need an assortment of good steel nails, and brads of various sizes, and some screws also. Strong pins are often useful. Staples and small screw eyes will be needed in many places, so get a supply before you start your shipbuilding.

Wood. You ought not to have much trouble in getting your wood supply. The boxes that canned goods come in, and soap boxes are likely to be made of wood that you can use. If your father uses soft wood kindling, you will often find suitable pieces in the wood pile. Sometimes you can get from storekeepers, just by asking, dry goods boxes of different sizes, or phonograph or radio packing cases that have fine pieces of veneer panels and strong pieces of thicker soft wood. Veneer panels are several layers of very thin wood glued together, the middle one thicker than the others. The best kind for you to use is the "three ply." It can be sawed with coping saws and is not liable to break or chip when you turn corners. Sometimes druggists will give you empty cigar boxes.

If in your town there is a factory that makes things out of wood, perhaps you can get from the superin-

tendent some of the waste pieces. Here are the names of some of the woods that you will find usable, in case you want to ask for any by name: (1) balsa, (2) butternut, (3) clear soft white pine, either sugar or California. Spruce would do, but it is hard to work. California redwood and fir are good, but splintery. If you use hard wood, basswood works very well and so does mahogany, especially the "Philippine grades."

In selecting your wood, try to get it straight-grained, so it will not be apt to split when you are working with it. You will sometimes want to drive small nails into thin strips of wood. If you use a small clamp or vise, to hold these strips, and tap the nail or pin gently with a hammer, you will not be so likely to split your wood.

The wood should be fairly light in weight, so that it will float well. If you have several kinds of wood from which to select, try each out in water before you decide which to use. Place each piece gently in a tub of water and let them float for a moment. Then remove them as carefully as you can. Examine the water line on each one. If the water comes near the top of a piece of wood, it would not make a good boat because it would sink too deep into the water. It is better to select wood on which the water line is about halfway between the top and the bottom.

In addition to blocks of wood for the hull of your boat, you will need sticks for masts, funnels, and so on. Dowels made of spruce or pine are very useful. The half-inch size is good for masts, the quarter-inch

size for yards, the three-fourths-inch or one-inch size for funnels.

Three ply veneer panels are good to use for figure-heads, and such things as the dragon's head and the shields on a Viking ship.

What Kind of Ship Shall I Build?

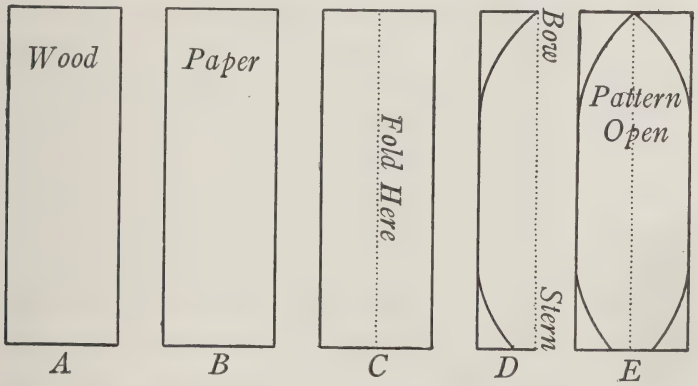
The first thing to do is to make up your mind as to what kind of boat to build. This, of course, will depend on the size of the pieces of wood you have to work with. If you have only a small piece, say 10 inches long, 4 inches wide, and 2 inches thick, it will be better to make a tugboat or a barge. For a schooner or a steamship, you ought to have a piece 20 or more inches long. You will make your ships more true to life if you remember what you have read in this book about the length and the breadth of different vessels.

Ocean liners, tramp ships and oil tankers are good boats to begin with. They are easy to make although of course they cannot be sailed. But floating them on a pond or river or even on the ocean is great fun.

If you wish to build a boat that you can really sail on a lake or pond, one of these will suit you better: catboat, sloop, yawl, or schooner. This book has pictures of all of these on different pages. Before you start to build any of them, figure out how far the masts ought to be from the bow or the stern, also the height of the masts, the shape and size of the sails, and the length of booms and gaffs.

Drawing Your Plans

Before you begin to build a ship, you should draw two plans. The first should show just how you want your boat to look when finished. The second should show the shape of the top of the hull, or the hull plan. Before making the first plan, study several pictures to see just how your boat should look, or better still, look at a real boat. Before making your hull plan, look at ship and boat pictures and see how the shape at the bow is different from the shape at the stern.



Now for your pattern! Cut a piece of paper the same width as your wood and as long as you want the boat to be. Fold the paper in the center lengthwise. Begin at the fold and draw the bow and stern as you think they should be. The sketches will show you the different steps in making a pattern and getting it on the hull.

Lay pattern E on the wood. Fasten it down securely with thumb tacks and draw around it. Now you are ready to cut out the wooden hull.

If you have a good coping saw with several extra blades, and if you also have a lot of patience you may want to saw out the hull yourself. But if someone near you, perhaps a furniture maker, has a band saw it will be better to ask him to saw it out. He can do it in a very few minutes and will probably charge you only a few cents.

Usually you will want to shape, or taper, your masts and yards. You can do this with a plane, turning your stick slightly while you are planing it until you get the size and tapering you want. You can also make a round stick out of a square one, if you have to, first by trimming off the four corners and then gradually trimming off any other corners, or ridges.

When you come to rigging your boat, putting on cabins and funnels, and arranging a propeller and a rudder, you will want to experiment for yourself. Each kind of boat is different from every other kind. The important thing is to try to make whatever boat you are building as true to life as you can. The pictures in this book will help you.

Helpful Hints

How to Set the Masts in Your Boat. As soon as the hull is sawed out you should draw a line lengthwise, exactly through the center of the hull, on both top and bottom. The line on the bottom marks the place for the keel. The line on top will help you to place the masts, and cabins. Select a slender dowel for the mast; the half-inch size is best. Select a bit

that makes a hole only a very little larger than the dowel, first trying the bits on a piece of scrap wood. When you have found the right one, bore the hole (or holes) at least three-fourths of an inch deep. Be sure to hold the brace and bit steady. If you do not, the hole will be too large. Do not forget that the hole must be bored *on the center line.*

If by accident your mast hole should be too large, you can fasten the dowel in with a little plastic wood which you can get at almost any hardware or paint store. But it is much easier to do it right in the first place.

Sails and Rigging. Ordinary bed sheeting makes the best sails, and probably your mother will have some that you can use. "Fish twine," which you can buy at a sporting goods store is best for the rigging of any boat that you intend to sail, because it will not stretch when wet.

If you want to work a tiny screw-eye into the end of a mast, to hold the rigging, it will be easier if you first wind a string tightly around your mast several times. This is what is called "whipping."

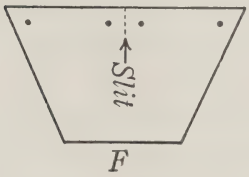
How to Fasten a Cabin on to the Deck. A cabin can be nailed on if you work carefully, and if you will not be discouraged if you split one or two cabins before you get one to stay on.

Use very slender nails, one half or three fourths of an inch *longer* than the thickness of the cabin. You should put a nail at each end. Hammer them through the cabin first. Then place the cabin on the deck and finish nailing it in position.

Another way to fasten the cabin on is to use plastic wood. Be sure it is damp, and do not use too much. Follow the directions on the can.

If you nail the cabin on, do not add funnels or rails until you have finished nailing; but if you use plastic wood put the funnels and rails in place before you stick the cabin on the deck.

How to Make a Keel. Use the lightest weight galvanized iron. Fold a piece of paper and draw half the keel. Slit the paper one inch along the fold. Lay your pattern on the galvanized iron and mark around it. Be sure to mark down the one-inch slit. Cut out the keel with tin snips; cut the one-inch slit also. Now put the keel in the vise. Begin at the slit and hammer one side to the left and the other to the right. Hammer both sides down flat. Then with a large nail punch two holes in each side, one near each end. Now the keel is ready to put on the boat. It will look like figure F. Be sure you get it *exactly on the center line.*

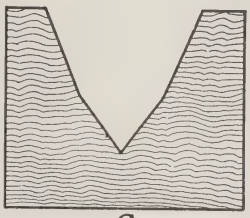


F

It is a good idea to use only thumb tacks to hold the keel in place until you see whether the boat balances properly in the water. If it does not, you will have to move the keel. If the keel is not heavy enough to balance the masts, get some grown-up person to solder some lead on to its lower edge. The soldering iron is dangerous to use and you should not try to do it alone.

If your boat has a keel, or if the bottom of the hull

is curved, make a "cradle" or frame to stand it in when you are not sailing it. Looking at it from the end, the cradle will be shaped like figure G. The end boards from apple boxes or orange boxes can be used in making cradles.

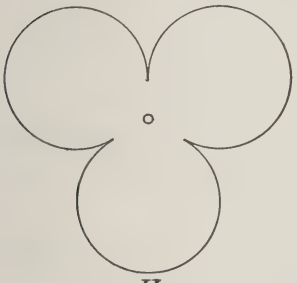


G

How to Make a Propeller. Lay a coin or round button on a piece of thin galvanized iron. Draw around it three times, like figure H:

Erase all inside lines.

With sharp tin snips cut out the propeller in one piece. Bend each blade slightly. With a sharp and rather large nail, punch a hole through the center of the propeller. Fasten the propeller to the stern of your boat with a nail that is small enough to allow the propeller to spin.

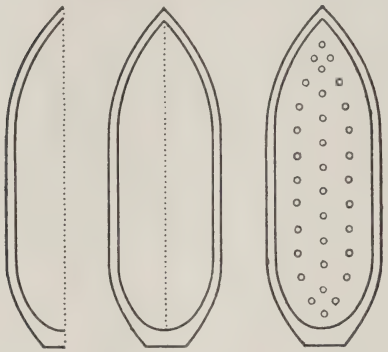


H

How to Hollow out a Boat. If you are making a Phœnician or a Viking vessel, you will want it hollowed out. To do this, mark and cut your pattern as shown in I and J before fastening it to the wood.

Put your boat in a vise or clamp. You will need a sharp chisel or gouge with about a three-fourth-inch blade, and a wooden mallet. Make a small groove all the way around on the inner mark (see figure K) with the chisel, but be very careful when

you are running the chisel lengthwise or you will split your wood. If you use a bit, your work will be easier. Drill two or three rows of holes quite close together as in figure K inside the groove that you have made with the chisel. This will make it easier to chip the wood away.



Do most of your chiseling with the grain of the wood. Try to get the bottom level, and the sides smooth. Do not tap the chisel too hard with the mallet. When you have chiseled it out as smooth as you can, use sandpaper to work out the rough uneven places. Always use a sandpaper block on a job like this — in fact whenever you sandpaper anything.

Hollowing out a boat is rather hard to do well, and you may be better satisfied to let the furniture maker do it for you.

Wooden button molds one or one and a half inches in diameter make good shields to put along the sides of Viking boats. Designs may be painted on them to make them look like real shields. Gold or silver paint helps to make them attractive.

Three ply panelling which we mentioned on page 246 is good to use for dragon heads on Viking boats if you are going to saw them out. If you prefer to

carve these decorative heads, basswood will be better because you can whittle it easily with a good sharp knife.

How to Paint your Boat. Before you start to paint your boat, stand it in a frame or cradle. If the boat has masts you will probably prefer to varnish rather than to paint them. Orange shellac is also a good finish for masts and decks.

Put all white and light colored paint on first. Three coats are usually necessary. Be sure that each is thoroughly dry before you put on the next coat. After the light colors, put on black or other dark colors where you want them. Use long strokes and paint with the grain. Try to paint smoothly. *Do not use too much paint.* If one color gets smeared on over another, clean off the spots with a bit of cloth wet in turpentine. Turpentine is good to clean your brushes also.

Building Model Yachts and Ships

If you plan to build a model sailing yacht, and perhaps enter it in a boat race, you will surely need help from some one who knows just how to do this sort of work, for much attention must be given to measurements, the shape of the hull, the arrangement of masts and sails, and so on. Some helpful pamphlets are published by the Junior Model Yacht Association, whose address is 709 Boylston Street, care of Community Service, Inc., Boston, Mass.

Perhaps the most interesting of all are the ships that can be used as ornaments. If you try your hand

at this work, we suggest that you begin with a Phœnician ship. Then make a Viking ship. And if you find that you are a good ship builder, perhaps you can make a model of the Santa Maria, or of a clipper ship. Your success with real models will depend upon how well you are able to follow directions fully worked out by some one else. You will need expert help. Several Ship Model Plans are published by Richter and Stroesser, 405 Eleventh Avenue, Milwaukee, Wisconsin, and the Model Ship Supply Co., Mineola, N.Y. Others are contained in the magazine *Popular Mechanics*, for example, the issues for December, 1927; April, 1928; November, 1929; and December, 1930.

You will find helpful suggestions in these books: *Build a Winning Model Yacht*, by T. Moore; *How to Make Clipper Ship Models*, by E. W. Hobbs; *The Ship Model Book*, by G. B. Douglas; *The Ship Model Builder's Assistant*, by C. G. Davis; *Ship Models: How to Build Them*, by C. G. Davis; *Ship Model Building*, by R. C. McCann (three volumes: I, Spanish galleon and Barbary pirate ship; II, American clipper; III, the frigate Constitution).

When your ship is finished you will want to select a good name for it, and then have a launching party. Real ships, of course, are launched before their masts and engines are put in place, but you will doubtless want to complete yours before the launching.

The different chapters in this book tell the names of many famous ships, and you will find others as you

read other books. You will also learn about the voyages of discovery, exploration, and trade upon which you can send your own ships. We hope that as a sailor you will never suffer fire at sea, or shipwreck, that you will weather every storm and that all your voyages will be prosperous ones.

BOOKS THAT WILL HELP YOU

"Boats," by N. C. Curtis.

Chapter III — Ship Models and How to Make Them.

"Boys' Book of Model Boats," by R. F. Yates.

Chapter II — How to make the hull; Chapter III — How to make simple boats.

"The Boys' Busy Book," by C. Fraser.

Chapters I–XIII tell about workshop, tools, etc., and about making toy boats.

"The Handy Boy's Book," by J. Barnard.

Chapters on tools and their use, kinds of wood, painting, gilding, and varnishing.

"Model Boat Building for Boys," by J. W. Cavileer.

Directions with diagrams and illustrations. Tools and materials are listed. There are suggestions for a model boat race.

"Your Workshop," by E. Plimpton.

Chapters VIII and IX give suggestions for building boats.

Exhibitions of Ship Pictures and Ship Models

If you visit any of the cities mentioned, you will find it very interesting to hunt up these museums.

New York, N. Y. The Museum of Science and Industry, 220 East 42nd Street, contains hundreds of models of vessels from those of ancient Egypt to the ocean liners of today.

New York, N.Y. The Metropolitan Museum of Art has on exhibition the ship models collected by

Colonel H. H. Rogers, and many other models of old-time warships, merchantmen, and other vessels.

New York, N.Y. The offices of the Cunard Line at 25 Broadway are decorated with wall paintings by Ezra Winter, representing four historic vessels. These are the ships of (1) Leif Ericson, (2) Christopher Columbus, (3) Sebastian Cabot, (4) Sir Francis Drake.

Boston, Mass. The Museum of Fine Arts has a large collection of old-time ship models, including an unusually fine model of the Flying Cloud.

Boston, Mass. The Old State House at the head of State Street contains a Marine Museum, with many ship models, ship pictures and curiosities.

Boston, Mass. The main office of the State Street Trust Company, on State Street, has been patterned after an old-time counting house, or merchant's office. There are ship models, ship pictures, a collection of stamps, and other things very interesting to all who love the sea.

Boston, Mass. The office of the First National Bank, on Milk Street, has on its walls four large paintings by N. C. Wyeth. These show (1) ships of the Phœnicians, (2) Elizabethan galleons, (3) Clipper ships, (4) A modern tramp ship.

Salem, Mass. In the Peabody Museum is one of the largest collections of ship models, ship pictures, and marine relics in the country. See page 197.

South Dartmouth, Mass. The whaleship Charles W. Morgan is moored here beside a wharf. The town is not far from New Bedford, whose Whaling Museum we mentioned on page 202.

Nantucket, Mass. For more than two hundred years Nantucket was the leading whale port of the world. In the town's museum are relics and curiosities saved from those days.

Provincetown, Mass. The Historical Museum contains a model of a whaler, and the collection of curiosities brought back from the Arctic by Donald B. MacMillan.

Washington, D.C. The United States National Museum contains hundreds of models of sailing vessels, steamships, and all sorts of boats, especially those of North America.

Philadelphia, Pa. The Commercial Museum has a large collection of models illustrating the history of ships from ancient times to the present.

San Francisco, Cal. There is a collection of ship pictures and models in the De Young Museum, in Golden Gate Park. The San Francisco Model Yacht Club maintains an exhibit of model yachts on Spreckels Lake.

XVI. FIRST POINTS IN SAILING A BOAT

SAILING a real boat is something that you can learn to do only by doing it. You must have a good teacher to show you how, and it will take a good many lessons. There are some things, however, that you can learn from a book, so we will give them to you here.

Sailing vessels are propelled by the wind, and a good sailor can keep his boat on her course no matter what the direction of the wind is. How to do this can be learned only through practice.

The wind may be blowing from any quarter and at any angle to the boat's course, and each of these directions has a name of its own. When the boat has the wind right aft and is moving in exactly the same direction as the wind, she is running.

When sailing as nearly into the face of the wind as she possibly can, a boat is said to be close-hauled, because the sheets are then hauled well in so that the sails are flattened. Other ways of saying the same thing are, on the wind, or sailing close to the wind. But no matter from what direction the wind may blow, as long as it allows the boat to steer her course it is a fair wind. Anything else is a head wind. When the wind is coming steadily from ahead, the boat can move ahead only by making a series of zigzags, or tacks. By each tack she gets the wind sufficiently aslant to drive her forward. The two sides of any vessel, as you know, are called starboard and port. The same words are used to define tacks. A sailing vessel is on the starboard tack when the wind is blowing against her starboard side. She is on the

port tack when it is blowing against her port side. To shift from one tack to another is called going about, and there are two ways of doing this, (1) by tacking, and (2) by wearing, or jibing.

Tacking is by far the commoner way of going about. Suppose that a vessel is sailing on the starboard tack and the helmsman wishes to change to the opposite, or port, tack. He will put his helm hard "down" — that is, to leeward, or away from the wind, which in this case is the port side. By this action he turns the *head* of the vessel toward the direction in which the wind is blowing. For a moment or two the sails shake with the vessel's bow pointed straight into the wind and then she comes round; then the sails begin to draw on the other side, and the vessel is off on the port tack. At the moment when the sails are shaking with the vessel's bow into the wind, a vessel is said to be in stays. If when she is luffed up — which is another term for putting the helm down to leeward — a vessel refuses to face up into the wind and drops back on her old tack, she has missed stays. This may be a serious matter. We will suppose that a vessel has been kept on one tack till she is too close to the shore. If, when she is luffed up, she has not way enough to carry her around, but falls back on her old tack, she will run straight ashore and be wrecked. Or she may meet with another misfortune, especially if she is square-rigged; she may come round just far enough to point her bow into the wind and there stick in stays with her bowsprit pointing like the arrow of a weather vane and her sails

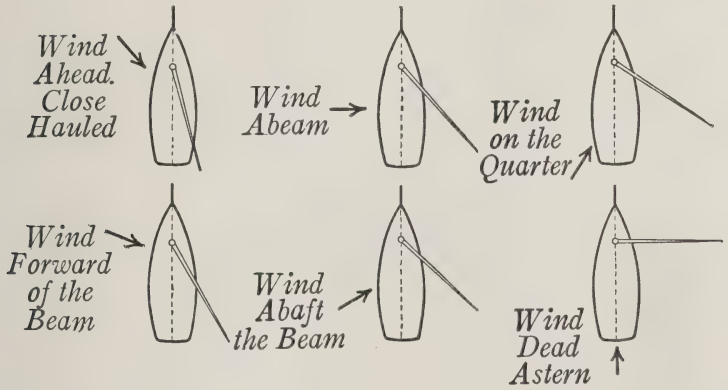
shaking but not filling on one side or the other. In this position she is said to be in irons, and she may drift stern-foremost on the shore.

Certain rigs are much quicker and handier than others in tacking. In a sloop, for instance, you have only to let go the jib-sheet and fore-sheet on one side, and haul them in on the other; the wind does all the rest of the work.

Now let us explain wearing, or jibing. To wear a ship you put the helm up — that is to windward — instead of down, and thus bring the vessel round with her stern to the wind instead of her bow, as in tacking. Though sometimes this may be a good thing to do, there are many reasons why as a rule it should not be done. Among them is this one. The main force of the wind blows against the end of the mainsail farthest from the mast; therefore the force with which this sail jibes, or comes over, is very great, and the strain may snap the mast off. This is quite likely to happen with a sloop, or any fore-and-aft rigged vessel.

You ought to understand also the meaning of such expressions as a beam wind, a point nearer the wind, within four points of the wind, and so on. The compass, as you can see from the diagram on page 262, has thirty-two main points. Just as the compass is divided, so we may divide the whole horizon around our ship. Now let us draw an imaginary line along our ship's deck from her rudder to her bowsprit. We shall have sixteen of these thirty-two points on the starboard side and sixteen on the port. Consequently

from right aft to right abeam will be eight points, and from right abeam to right ahead will be eight points. Four points will be mid-way between right abeam and right ahead. There are smart fore-and-aft rigged craft — some racing sloops, for instance, and fore-and-aft schooners — that will sail even with the wind so far ahead as this. Square-rigged vessels cannot sail so close. Their strength lies in running, but some are able to sail within six points of the wind.



Rules of the Road for Sailing Vessels. A steamship or power boat always gives way to a sailing vessel because the latter can less easily change its course. Here are the rules where sailing vessels only are concerned:

1. A boat running before the wind must keep out of the way of a boat sailing close-hauled.

2. If a boat is sailing close-hauled on the port tack — that is, has the wind blowing in from the left side — it must give way to a boat sailing on the starboard tack.

3. A boat running before the wind with the wind on the port side must give way to a boat running free with the wind on the starboard side.

4. If two boats are running similarly before the wind, the one to windward must give way.

BOOKS THAT WILL HELP YOU

"Harper's Boating book for Boys," by C. G. Davis.
"Small Boat Sailing," by E. F. Knight.
"Practical Boat Sailing," by D. Frazer.
"Handbook for Boys," published by the Boy Scouts of America.

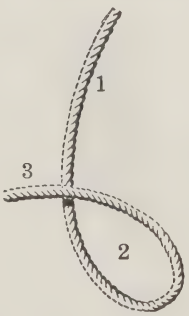
Chapters on Rowing a boat, Canoeing, and Sailing.

"The Sea Scout Manual," published by the Boy Scouts of America.
'Scouting for Girls," published by the Girl Scouts.

XVII. SOME SAILORS' KNOTS

SAILORS know many ways of making ropes fast to each other, or to spars, rings, and posts. The knots they form in doing these things are known also as bends or hitches, and many of them have interesting names. Probably you would like to know how to form some of these. The best way to learn is to watch someone who knows how, but we believe that you can puzzle out the simpler ones from our diagrams. Notice carefully where a part of the rope passes over another part, and where it passes under it.

When you join the Boy Scouts, the Sea Scouts, or the Girl Scouts, you will be expected to learn other knots. Members of these organizations are taught how to manage small boats; and anyone who sails a boat often finds it necessary, not only to fasten ropes securely, but also to do this rapidly and in such a way that the knots can easily be undone.



Before you try to form any of the following knots, you should understand the meaning of three words likely to be used by anyone who explains the different bends and hitches. (1) The "standing part" of a rope is the long portion not used when you form a knot; (2) the "bight" is the loop made whenever you turn a rope back upon itself; (3) the "end" is the part you pass around the standing part.

[1] As you practice forming knots, we suggest that you use No. 64 round cotton braid, manufactured by the New Bedford Textile Company, of New Bedford, Mass. This is easy to work with, ties and unties readily, and is large enough to show clearly all the details of the different knots.

SQUARE OR REEF KNOT: This is used to tie reef points when sailors reef a sail, to secure sails, and for many other purposes. It is the commonest way of tying together the ends of two ropes of equal thickness. It never slips or jams, and is easy to untie. Begin as in A; finish as in B.

SHEET BEND: This is used in tying together the ends of two ropes of unequal thickness. Sometimes it is used in fastening flags to halliards.

SLIP OR RUNNING KNOT: This is a noose which allows a rope to be used like a lasso.

THE BOWLINE: This is a noose that never slips. The heavier the pull upon it, the tighter it holds. It is used for hoisting or lowering. Men who are lowered over the side of a vessel for painting or repairing it sometimes sit in a bowline. Begin as in A; finish as in B.

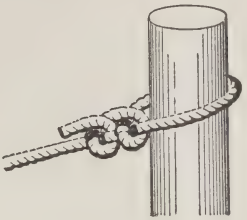
TWO HALF-HITCHES: These are useful because they are easily made and will not slip under any strain. They are used to make fast the end of a small rope to a post or a ring, as when tying up a small boat to a pier.

TIMBER HITCH: This is used in towing spars or logs. It keeps the spar on a straight course. You should make a half hitch or two back toward the end of the spar.

CLOVE HITCH: You will see this used on the hawsers that tie up a large steamship to the pier. It holds snugly and is not liable to slip sideways.

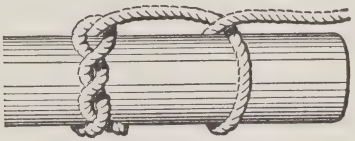
SHEEPSHANK: This knot is used for temporarily shortening ropes that are too long for any particular purpose. To hold, the rope must be kept taut, or tight. These diagrams need to be explained, perhaps. Cross your hands and pick up the rope. Then draw your hands past each other, so that the rope is arranged as in A. Next, hold the two long loops firmly in one hand. Form a bight between one loop and the end, as in B, and pass the loop through it. Do the same thing at the other end. Pull tight and you will form the knot, as shown in C.

FISHERMAN'S BEND: This is used to secure a rope to a ring on a buoy or a small anchor. You will notice that the end is "stopped down" to the standing part; that is, the two parts are fastened together with twine.

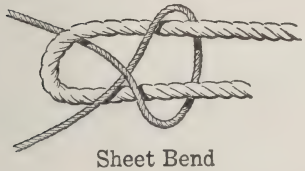


Two Half Hitches

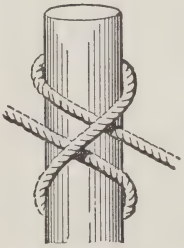
Square Knot



Timber and Half Hitch



Sheet Bend

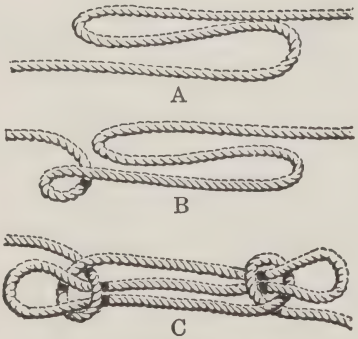


Clove Hitch

Fisherman's Bend

Slip Knot

Bowline



Sheepshank

XVIII

A LITTLE DICTIONARY FOR SAILORS

MANY other words used by sailors are explained in the different chapters of this book. The Index will help you find them.

ABAFT: Further toward the stern than the point one is speaking of.

ABEAM: The point exactly opposite a ship's mainmast.

ABOUT: To go about is to change the direction in which a vessel is sailing by shifting her helm and placing her on another tack.

AFT: At, toward, or near the stern.

AMIDSHIPS: Toward the middle of a vessel, from bow to stern.

BACKSTAYS: Ropes supporting a mast from behind.

BALLAST: The weight or the weights used to keep a vessel from being top-heavy.

BEAM: The greatest width, or breadth, of a vessel.

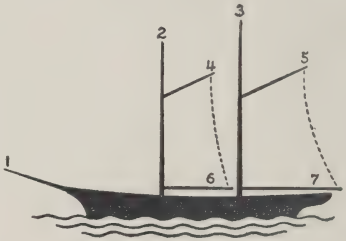
BELAY: To make fast any running rope so that it does not run out.

BEND: To bend a sail is to fasten it to its yard, boom or gaff. To bend a cable is to make it fast to its anchor.

BILGE: The flat, or nearly flat, part of a vessel's bottom.

BILGE KEELS: The fin-like strips running lengthwise on a vessel's bilge. They are placed there to prevent rolling.

BOOM: The spar at the foot of a fore-and-aft sail. Also, the spar of a derrick, used for hoisting cargo.



On the figure, the numbered parts are: 1. Bowsprit. 2. Foremast. 3. Mainmast. 4, 5, Gafts. 6, 7. Boom.

BOWSPRIT: A short spar almost level, sticking out beyond the bow of a vessel.

BRACES: Ropes running to the yard arms, used for pulling the yards into position so that the sails may catch the most wind.

BRIDGE: The platform or narrow deck built across and above a ship's deck for the use of officers and helmsman.

BRING TO: To check the course of a vessel so as to make her sails work against each other and almost stop

her. She is then said to lie to.

BROADSIDE: The full length of a vessel's side.

BULKHEAD: A wall running from side to side of the vessel, or fore-and-aft below the deck. The collision bulkhead is the one nearest the bow.

BULWARK: The wall along each side of a ship.

BUNKER: A room used for storing fuel.

CABLE: The chain to which the anchor is fastened. A cable's length means 100 fathoms, or 600 feet.

CAPSTAN: A kind of windlass used chiefly for raising the anchor by winding in the cable.

CAT-HEADS: Pieces of timber projecting from each side of the bow of a wooden vessel upon which the anchors are lifted when they have been heaved up or raised by the capstan.

CLEWLINES: Ropes attached to the bottom corners of a square sail, used in taking it in.

COMPANIONWAY: A stairway between decks.

COMPASS: The 32 principal points of the compass, going around with the sun are: *North* — North by East — North Northeast — Northeast by North — North East — Northeast by East — East Northeast — East by North — *East* — East by South — East Southeast — Southeast by East — South East — Southeast by South — South Southeast — South by East — *South* — South by West — South Southwest — Southwest by South — South West — Southwest by West — West Southwest — West by South — *West* — West by North — West Northwest — Northwest by West — North West — Northwest by North — North Northwest — North by West. Look at the diagram on page 262.

COURSE: The direction on which a vessel is moving.

COURSES: A name used for the foresail, mainsail, and spanker. When a ship takes in all her sails except these, she is said to be sailing under courses.

CROSSTREES: Two pieces of timber laid on and across the trestletrees to spread the upper rigging and to help support the top.

CROW'S NEST: A platform

like a barrel or a box on the foremast, where the look-out man stands.

CUTWATER: The part of a ship's bow which first meets the water.

DAVITS: Heavy posts, either curved or sloping, which hold the ends of a lifeboat. They are used in hoisting or lowering these boats.

DERRICK: A boom with tackle for handling cargo. It is supported by a derrick post.

DOLPHIN-STRIKER: The small spar set below the bowsprit, pointing down.

DRAFT, or DRAUGHT: The depth to which a vessel sinks in the water. When you say "She draws twenty feet of water," you mean that the keel of the vessel is twenty feet below the surface.

FATHOM: Six feet.

FORWARD: Toward the bow.

FREEBOARD: The height of a vessel's side above the water.

FURL: To wrap or roll a sail and tie it to its proper yard.

GAFF: The spar at the head of a fore-and-aft sail.

GANG-PLANK: A board with cleats as steps for entering or leaving a vessel.

GUNWALE: The top of the side of a boat.

HALLIARDS: Ropes used for hoisting a sail or flag.

HATCH: An opening in a deck for cargo or passengers.

HAWSE PIPES: Openings in the bow for the cable to run through.

HAWSER: A strong rope, sometimes made of wire, used in making a vessel fast to a pier.

HEAVE TO: Same as BRING TO. After it has been done, the ship is said to be hove to.

HEEL: To lean over to one side. A vessel heels because of the wind.

HOLD: The part of a vessel below decks used for storing freight and baggage.

HULL: The body of a vessel.

HULL DOWN: Said of a ship when she is so far away that only her masts can be seen above the sea.

JIB: A triangular fore-and-aft staysail, at the bow.

JIB-BOOM: A spar projecting out beyond the bowsprit. A flying jib-boom is a still lighter spar projecting out beyond the jib-boom.

KEEL: The lowest part of the hull of a ship. In wooden

ships it is a long timber running the whole length of the hull.

LATITUDE and LONGITUDE: Latitude means distance north or south of the Equator, and longitude means distance from the Meridian at Greenwich — near London. Both are recorded in degrees, minutes and seconds. (60 seconds = 1 minute; 60 minutes = 1 degree). At the Equator a minute of longitude is equal to a nautical mile, but as the meridians converge after leaving the Equator, until they meet at the Poles, the size of a degree becomes less.

LEE or LEEWARD: The side of a vessel away from the direction from which the wind is blowing.

LIST: To lean over to one side. A vessel lists because the weight aboard her is more on one side than it is on the other.

LOG: This word means two things (1) the instrument that shows how fast the vessel is traveling; (2) the daily record kept by the officers to show weather and wind, the speed of the vessel, the distance traveled in a day, important events, etc.

MASTS: If any vessel, except a yawl, has two masts, the one nearer the bow is called the foremast; the other is the mainmast.

The three masts of a sailing vessel are named foremast, nearest the bow; mainmast, the middle and tallest mast; mizzenmast, the smallest and nearest the stern.

In large sailing vessels each of these masts is made up of four pieces (1) the lower masts, which rest upon the bottom of the ship and make the first part above the deck; (2) the top-masts, next above this part; (3) the top-gallant masts, above the top-masts; (4) the royal masts, highest of all.

OFFING: To seaward.

OUTBOARD: The name given to small motors which can be fastened outside the stern of small boats.

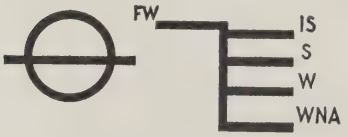
OVERHANG: That part of the hull which hangs out over the water at the stern.

PAINTER: A rope used for making fast a small boat.

PEAK: The top outer corner of any fore-and-aft sail that sets on a gaff.

PITCHING: The see-saw motion of a vessel plunging first her bow and then her stern into the sea.

PLIMSOLL MARKS (or load-line marks): These markings, named for the man who introduced them, appear on the starboard side of vessels — both steam, motor, and sail — of 80 tons or more. Exceptions are coasting steamers, fishing vessels, certain excursion boats, and pleasure boats.



Vessels, when loaded, must not sink in the water below the line through the circle. The other marks show variations allowed in different seasons or oceans. F. W. = Fresh water; I. S. = Indian Ocean in summer; W. N. A. = North Atlantic in winter (October to March inclusive); S. = Summer (except Indian Ocean); W. = Winter (except North Atlantic).

QUARTER: The stern portion of a ship's side.

QUARTER-DECK: The raised deck at the stern of old-time ships. It now means the part of the deck reserved for officers on men-of-war.

RATLINES: Small ropes crossing the shrouds to form ladders.

REEF-POINTS: Small ropes hanging in rows across a sail, for reefing, or making the sail smaller.

RIBS: The timbers rising from the keel and rounding out to form the sides of a wooden vessel.

ROLLING: The side-to-side swaying motion of a vessel tipping first one side and then the other down toward the sea.

RUDDER: The hinged projection at the stern of a vessel, by which she is steered.

RUNNING RIGGING: The rigging that works the sails and the yards.

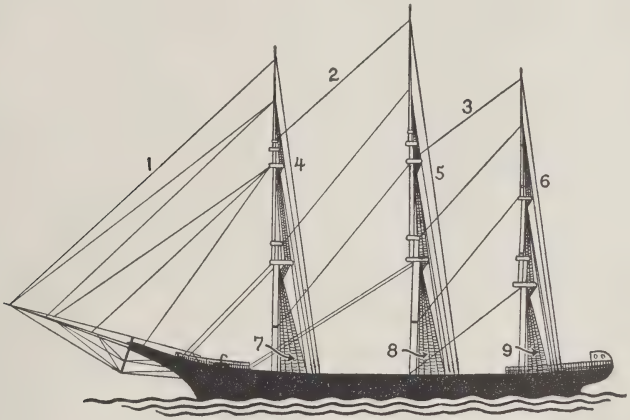
SAILS: These are named after the mast, stay, or boom on which they are spread. For example, foresail, fore topsail, fore-topgallant sail, fore royal, fore-topmast staysail.

SHEER: The curve of a vessel's hull between bow and stern. It is noticed when looking at a ship from beyond the side.

SHEETS: The ropes fastened to the end of booms, or to the after lower corner of a fore-and-aft sail.

SHROUDS: Ropes supporting a mast sideways.

STUDDING SAILS (pronounced "stun'sles"): Extra sails set outside the square sails on each side of the ship. They are named after the sails beyond which they extend. There are no studding sails on the mizzen-mast or on either side of the mainsail or on the royals of any mast.



1. 2. 3. Stays. 4. 5. 6. Backstays. 7. 8. 9. Shrouds.

SPAR: A rounded pole used to extend a sail. The word is sometimes used to mean a mast, a yard, or a boom.

SPINNAKER: A large balloon sail, of light canvas, used by racing yachts in running before the wind.

STANDING RIGGING: The rigging that supports the masts and bowsprit.

STAYS: Ropes supporting a mast from forward.

STERN: The rear end of a vessel.

TAFFRAIL: The rail around a vessel's stern.

TILLER: The handle at the top of the shaft to which the rudder is fastened. It is used only in the smaller vessels.

TOP: A platform resting on the crosstrees and the

trestletrees. Used by men working on sails or rigging.

TRESTLETREES: Two fore-and-aft pieces of timber, one on each side of the mast supporting the rigging, the upper masts and the cross-trees.

TUMBLE-HOME: The incline inwards of a ship's sides above the level of its extreme breadth. It is noticed when looking at a ship from beyond her bow.

WAIST: The main deck before forecastle and quarter deck.

WAY: A ship is said to be under way when she is in motion, either by wind, engine, tide or current.

WEATHER: To weather a ship, headland, etc., is to sail to windward of it. Weather bow is that side of the bow on which the wind is blowing.

WHEEL: The wheel attached to the steering-gear of a ship.

WEIGH: To heave up the anchor.

WINDWARD: The side of a vessel toward the wind.

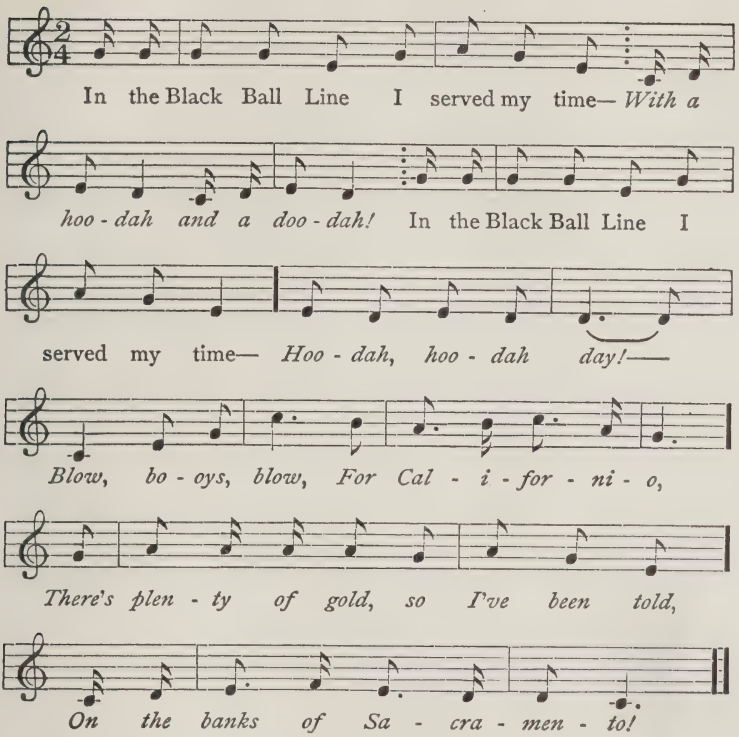
Opposite to LEE, or LEEWARD.

YARDS: Spars set crosswise of a mast, to support square-sails. Each yard takes its name from the name of that part of a mast which it crosses. For example, fore-topsail yard, main yard, mizzen-topgallant yard. There is one exception. The cross-jack yard (pronounced "crojik") is the lowest yard on the mizzen-mast and in recent years has had no sail set upon it.

YARD-ARMS: The ends of a yard, where the rigging is placed.

In several of the books given in our lists you will find brief glossaries, or little dictionaries of words used by shipbuilders and sailors. A very complete one with illustrations is: *A Glossary of Sea Terms*, by G. Bradford.

XIX. A SAILORS' CHANTY

THE BANKS OF SACRAMENTO

In the Black Ball Line I served my time— With a
hoo - dah and a doo - dah! In the Black Ball Line I
served my time— Hoo - dah, hoo - dah day!—
Blow, bo - oys, blow, For Cal - i - for - ni - o,
There's plen - ty of gold, so I've been told,
On the banks of Sa - cra - men - to!

We were the the boys to make her go —
With a hoodah and a doodah!
Around Cape Stiff in frost and snow —
Hoodah, hoodah, day!
Blow, bo-oys, blow,
For Californi-o!
There's plenty of gold, so I've been told,
On the banks of Sacramento!

Around Cape Stiff in seventy days —
With a hoodah and a doodah!

Around Cape Stiff is a very long way
Hoodah, hoodah, day!
Blow, bo-oys, blow,
For Californi-o!
There's plenty of gold, so I've been told,
On the banks of Sacramento!

This is a specimen of the songs sung in the old days by sailors at work. This particular one is called a capstan chanty since it was sung when that machine was being used to weigh the anchor. A leader, known as the chantyman, sang the lines printed in Roman type, and the men at work joined in the chorus which is printed in *italics.*

In this chanty the Black Ball Line referred to is the line of sailing packets told about on page 209; there is also a reference to the California gold rush; and Cape Stiff is a nickname for Cape Horn (page 214).

C. Fox Smith's *A Book of Shanties* is one of the most interesting collections of the words and music of these old songs of the sea. Others are Joanna C. Colcord's *Roll and Go*, and Robert Frothingham's *Songs of the Sea and Sailors' Chanteys.*

A READING LIBRARY

THE whole story of ships and the sea cannot be told in a single book. In this one we have tried to tell you some of the most worthwhile parts. We hope that you have enjoyed reading also some of the other books that we have mentioned. Perhaps you are ready to look up still more books. There are many hundreds to select from, and we will therefore give you a little help in choosing. We are sure that you will enjoy any of those in the following lists. We have included books that contain attractive pictures, many of which are colored.

Some of these books tell the same stories, so of course you will not wish to read them all. The larger public libraries usually own nearly all the books in this list; but if you cannot find the book that you think has the most attractive title, try to find another in the same group.

Some of the best ship pictures that have ever been printed are found in these books, which give also descriptions of many kinds of ships: *The Book of Old Ships*, by H. B. Culver, with drawings by Gordon Grant; *From Carrack to Clipper*, by F. C. Bowen; *The Golden Age of Sail*, by F. C. Bowen; *Greyhounds of the Sea*, (clipper ships), by C. C. Cutter, with illustrations by J. R. Patterson and others; *Sail: the Romance of the Clipper Ships* (two volumes), by B. Lubbock, illustrated by J. Spurling; *The Sea, its History and Romance*, by F. C. Bowen; *Some Famous Sailing Ships and Their Builder, Donald McKay*, by R. C. McKay; *The Yankee Whaler, by* C. W. Ashley.

Here are stories about famous American ships and sailors of other days: *Deep Water Days*, by O. G. Swan; *Sagas of the*

Sea, edited by J. L. French; *The Clipper Ship*, by H. Daniel; *The Clipper Ship Era*, by A. H. Clark; *A History of Travel in America*, by S. Dunbar; *The Real Story of the Whaler*, by A. Verrill; *The Story of the New England Whalers*, by J. R. Spears; *The Story of Old Ironsides*, by E. P. and A. A. Knipe; *Naval Engagements of the War of 1812*, by J. Barnes; *The Story of Our Navy*, by W. J. Abbot.

These books cover the whole history of American ships, from the beginning down to the present day: *Famous Seamen of America*, edited by H. H. Webster and E. M. Powers; *The Story of the American Merchant Marine*, by J. R. Spears; *The Story of our Merchant Marine*, by W. J. Abbot; *The Tale of our Merchant Ships*, by C. E. Cartwright.

These books describe the ships of today, not only those that we tell about in Chapters I, II, III, and XIV, but also many others: *The Book of the Gloucester Fishermen*, by J. B. Connolly; *The Lookout Man*, by D. W. Bone; *Marvels of Modern Mechanics*, by H. T. Wilkins; *The Romance of the World's Fisheries*, by S. Wright; *The Romance of a Modern Liner*, by E. G. Diggle; *Ships for All*, by F. C. Bowen; *The Ships We See*, by F. C. Bowen.

When you want to find out about the cargoes that ships carry, and their routes, look up these books: *Ships and Cargoes*, by J. Leeming; *Trade Routes and Shipping Services* (United States Shipping Board).

These books tell about schooners, brigs, barks, full-rigged ships and other kinds of sailing vessels: *Fore and Aft*, by E. K. Chatterton; *Sailing Ships and Their Story*, by E. K. Chatterton; *The Sailing Ship*, by R. and R. C. Anderson; *The Ship under Sail*, by E. K. Chatterton; *Ships and Ways of Other Days*, by E. K. Chatterton.

These tell the story of steamships: *The Boys' Book of Steamships*, by J. R. Howden; *Mississippi Steamboatin'*, by H. and E. Quick; *Paddle Wheels and Pistons*, by I. Anthony;

Steamships and Their Story, by R. A. Fletcher; *The Ship under Steam*, by G. G. Jackson; *Steamboat Days*, by F. E. Dayton and J. W. Adams.

Here are books about lighthouses and lightships: *Lighthouses and Lightships of the United States*, by G. R. Putnam; *The United States Lighthouse Service* (Government Printing Office.)

If you are attracted by stories of discovery or exploration, and by stories of the early traders and pirates, you will find much that is interesting in these books: *The Book of Polar Exploration*, by E. L. Elias; *English Voyages of Adventure and Discovery*, by E. M. Bacon; *Great Moments in Exploration*, by M. F. Lansing; *Great Pirate Stories*, edited by J. L. French; *In Search of Gold*, by W. D. Fordyce; *The Old East Indiamen*, by E. K. Chatterton; *The Romance of Early Exploration*, by A. Williams; *The Romance of the Spanish Main*, by N. J. Davidson; *Tales from Hakluyt*, by F. Elias; *Vikings of the Pacific*, by A. C. Lant; *Buccaneers of the Pacific*, by G. Wycherley.

Here are stories about ships, sailors, and life and adventure at sea: *A Book of the Sea*, by A. Williams; *Conquests of the Sea*, by C. Hall; *Sea Stories for Boys*, edited by A. Neale; *Great Sea Stories*, edited by J. L. French; *Great Sea Stories of All Nations*, edited by H. M. Tomlinson; *Lost Ships and Lonely Seas*, by R. D. Paine; *The Atlantic*, by S. Rogers; *The Pacific*, by S. Rogers; *Sea-Lore*, by S. Rogers; *Ships and Sailors*, by S. Rogers.

In these you can read not only about the ships of long ago, but also about those of our own time: *The Book of Ships*, by E. Protheroe; *The Book of the Ship*, by G. G. Jackson; *Catalogue of the Watercraft Collection in the United States National Museum* (Government Printing Office); *Down to the Sea in Ships*, by I. Anthony; *Historic Ships*, by R. S. Holland; *The Romance of the Sea*, by G. G. Jackson; *The Romance of the Ship*, by E. K. Chatterton; *Ships of the Seven Seas*, by H. Daniel.

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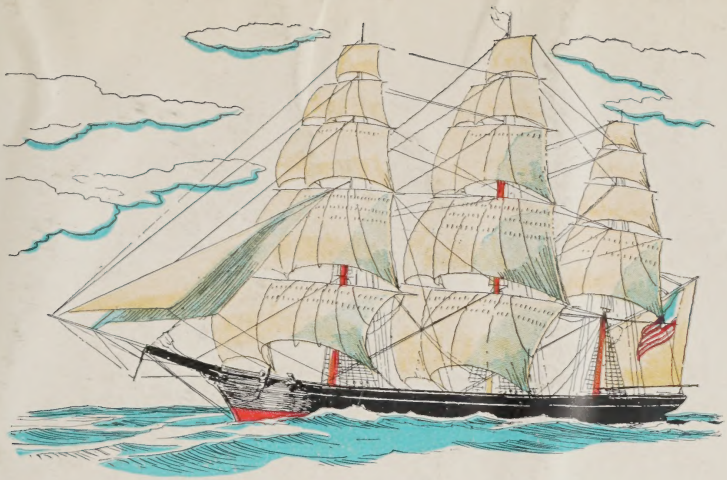

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